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THESIS

A COMPARISON OF THE STATUS OF COMMERCIAL AVIATION IN THE UNITED STATES AND FOREIGN COUNTRIES

by

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TABLE OF CONTENTS

Page
INTRODUCTION 1

CHAPTER

I HISTORICAL SURVEY 4

II WORLD AERONAUTICS IN GENERAL 10

III EFFECT OF WORLD WAR ON AERONAUTICS 16

IV NATIONAL ADMINISTRATIVE ORGANIZATION 21

V PRINCIPAL AIR SYSTEMS OF THE WORLD 23
  The United States 23
  The Dominion of Canada 36
  Central America 41
  South America 42
  Europe 45
    French Companies 45
    German Air Services 50
    The Netherlands K.L.M. Company 54
    British Air Power 55
    Italian Air Forces 61
    Union of Soviet Socialist Republics 64
  Asia 66
    Persian Service 66
    Japanese Program 67
    Aviation in China 69
  Africa 71
  Australia 73

VI CHARACTERISTICS AND EFFICIENCY OF AIR TRANSPORT 78
  Speed 78
  Regularity 81
  Safety 82
  Radio Development 93

VII FUNDAMENTAL REQUIREMENTS OF COMMERCIAL PLANES 95

VIII LICENSING OF AIRCRAFT ACCORDING TO NATIONAL LAW 97
  Airworthiness 97
  Registration of Aircraft 99
  Insurance Responsibility 101

IX LICENSING OF AIRMEN IN THE DIFFERENT COUNTRIES 105
  Foreign Countries 106
  The United States 107

CHAPTER Page

X SOVEREIGNTY IN THE AIR 111

XI COST OF AIR TRANSPORT 117
- Capital Charges 117
- Operating Charges 119
- Why Various Estimates Conflict 120

XII SCHEDULED AIR TRANSPORTATION 122
- Basis for the Development of Air Transport Operations 122
- Air Mails 124
- Air Passenger Transportation 133
- Air Express 140

XIII UNITED STATES GOVERNMENT ACTIVITIES 145

XIV SUBSIDIES FOR COMMERCIAL AVIATION 149

XV INTERNATIONAL COMMERCIAL AVIATION 154

CONCLUSIONS 158

BIBLIOGRAPHY 161

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CHARTS

Page

A Schedule of the Early Transatlantic Flights 17

Scheduled Air Line Operators 23

Throughout the World 76

European Air Fleets 77

Table A - Miles Flown per Accident in Scheduled Air Transport Services for Each 6 Months' Period of the Years 1928, 1930 1931, 1933 85

Table B - Analysis of Causes of Accidents in Scheduled Air Transport Services 1932 86

Table C - Analysis of Causes of Accidents in Scheduled Air Transport Services 1933 87

Table D - Mileage Flown per Accident and Fatality in Miscellaneous Flying Operations 88

Table E - Analysis of Causes of Accidents in Miscellaneous Flying Operations for the Period - July-December 1933 89

Table E - (Continued) 90

INTRODUCTION

Commercial aviation, more than any other means of international communication, brings us close to the realization of certain ideas dimly conceived in bygone centuries. From the moment that man discovered himself earthbound, he has been struggling to break the chains of bondage. The hope of being able to soar in the air, vying with the birds in gracefulness and strength, has been his vague yet persistent aspiration. When, as a result of the patient researches of the scientists and the sacrifices of many lives, the solutions of aerial flight were discovered, man was amazed at the novelty of the conquest and was enchanted by the realization of an age-long dream.

Enormous strides in aeronautics have been made during the past decade. At this time few of us realize how primitive are the aircraft of today as compared with conditions which undoubtedly will exist a few years hence. Changes and improvements are being worked out daily in slow steps and in minute calculations, for the vision of the industry is forward. For centuries there have been important geographical discoveries, and there have been many thrilling scientific inventions, but time has granted this epoch the privilege of being the pioneer in flying great distances.

With the perfecting of the airplane for long distance coverage will come a demand for international cooperation. Airways must be standardized, and standardization will be

possible only if air traffic is developed in an atmosphere of good will, and not one of mistrust. Suitable agreement must be concluded between the individual states and countries. In order that air transportation may be developed in its broadest sense, the cooperation of the entire world must be secured.

The various countries seem to agree that it is to their general interest that no country should hamper the expansion of international air navigation by unduly severe restrictions or by excessive precautions. Liberal treatment in the matter of communications and transit has become, more or less, a moral duty which every civilized nation is proud to recognize. Each nation must form its own rules, but these rules must be, to a great extent, in conformity with the regulations proposed by other countries. The whole of its internal organization including the marking out of its territory, visual signals, ground marks, and meteorological system must fall in line with the rules of other countries and universal needs must be considered.

Many of the measures and regulations which have been adopted by the various countries either hamper international commercial aviation or do not take its development sufficiently into account. Some of these questions call for the conclusion of a universal convention. To ensure international uniformity for the general rules of traffic, there is urgent need that in all the transport regulations adopted by the different countries, the essential stipulation relating to traffic should be uniform and homogeneous.

Nationalism in the air is obviously against the nature of things. In the future it may be possible to fly over countries at an altitude which will make sovereignty an empty word because all control will be illusory. The problem of the hour is neither technical nor economic, but purely political. There must be the spirit of understanding in political circles, a spirit as international as air traffic itself, of the technical and economic realities which govern this mode of transport.

It is with some trepidation that the following report of aeronautical conditions is presented. An abundance of technical material is available, but facts concerning the status of international aviation often have seemed to be somewhat contradictory. The picture as given represents hours of research work and an effort to select facts of interest. To one whose aeronautical knowledge has been gleaned from thrilling accounts of flights across land and sea, and from reports of ghastly accidents in the air, the preparation of the material as presented in this report has been absorbingly interesting and very revealing.

CHAPTER I

HISTORICAL SURVEY

The origin of man's attempt to solve the mystery of flight and the story of the evolution of the thought into reality is traceable from the time that man rose out of the geological ages. This period is now calculated by archeologists at about one million years, on an earth that has been flying around the sun for some two billion years.

Visionary speculations were followed by practical theories and inventions by the scientist. It has taken more than five thousand years for man to materialize his immaginative conceptions.

Three thousand years before the birth of Christ the Egyptians had carved upon stone fanciful figures of men and of animals each with wings. The Assyrians had done the same thing.

Archimedes, a Grecian Mathematician, who lived several centuries before the Christian era, established principles which are successfully applied in the most modern types of airships.

In one of the shows put on by Nero fifty-eight years after the death of Christ, there was an attempt to fly. It was a failure.

In the year 1040 a monk named Elmer attempted to fly from the top of a tower.[1] In 1617, supported by a primitive parachute consisting of a square framework covered with canvas,

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[1] Miller, The World in the Air, Vol. 1, P. 33

Fauste Veranzio risked his life in demonstrating his theories by making a descent from a high tower in Venice.[1]

Thousands of pages have been written about early attempts to fly. In the fifteenth century scientists began to give the subject serious thought. Leonardo De Vince made a detailed analysis of the way birds flew. It is recorded that De Vince discovered gliding and it is upon this method of bird flying that the present airplane is constructed.[2]

"The discovery of the mechanism whereby flight could be accomplished depended upon the realization of two facts which are fundamental. The first, that the air--the medium in which it was desired to travel--has definite substance and therefore mass; and the second, the laws governing motion as stated by Newton. The realization of these two fundamentals constituted in itself the proof that artificial flight was theoretically possible. There remained, however, the necessity for much patient research and experimental work in order to render it a practical possibility."[3]

In the seventeenth century scientists discovered that air has a definite weight, and that bodies lighter than air would rise as would a chip of wood when released under the surface of the water. Francesco De Lama[4] developed a creation which was to be sustained by four large hollow metal spheres from the interior of which all air was to be exhausted. These metal spheres were held in fixed relation by a framework of wood and a boat or body was provided with oars and sails by which it was to be propelled. De Lama's ideas and theo-

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1. Miller, -op. cit.- P. 33
2. Americana Encyclopedia, The, Vol. 1, P. 185
3. Davy, M. J. B., Henson and Stringfellow; their Work in Aeronautics, The History of a Stage in the Development of Mechanical Flight.
4. Keir, Malcolm, The Pageant of America, The March of Commerce P. 331

ries were much the same as those which determine the balloons of the present day.

Early in the eighteenth century Karl Freedrich Meerwin, a German scientist, invented a form of glider which demonstrated the law of resistance.

In 1776 Cavendish[1] discovered hydrogen gas, and his proof that it was lighter than air represents the beginning of actual aerial navigation.

"By far the most important contribution to the science of aeronautics during the first half of the nineteenth century were made by Sir George Cayley (1774-1857), who has been described as the 'Father of British Aeronautics' but whose reputation is justly international. He was the first man of science to apply his mind fully to the problem of mechanical flight and to attempt to explain mathematically its fundamental principles. He countered the prevalent confusion of thought by a definition of the 'whole problem' of mechanical flight as being: 'To make a surface support a given weight by the application of power to the resistance of air'. This clear statement of principle indicated the 'modus operandi' upon which development subsequently took place resulting in the accomplishment of heavier than air flight, and it marked the first stage in progress."[2]

"Cayley's work in the early part of the 19th Century provided practically all the knowledge necessary for the accomplishment of mechanical flight and it remained for others to apply that knowledge to practical advertising and to develop

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1. Americana, The, -op. cit.- P. 182
2. Davy, M. J. B., -op. cit.- P. 12

a suitable prime-mover on the lines he had advocated."[1]

The Montgolfier[2] brothers, Stephen and Joseph, have been given the credit of inventing the aerostatic airship. They made a paper balloon of seven hundred cubic feet capacity which was filled with smoke and heated air and which rose to the height of one thousand feet. Not long after this experiment, Charles,[3] a scientist, became familiar with the properties of hydrogen but up to that time no fabric had been made that was thoroughly air tight. Fortunately, a man named Roberts[4] came to the rescue with a discovery that it was possible to apply a coating of dissolved rubber to silk fabric and thus secure an air tight covering. In 1814, a powerful stimulus was given to aeronautics by the discovery of coal gas and its value in the inflation of balloons.

During the nineteenth century while French and German scientists were attempting to conquer the air, English and American authorities watched and waited for the time when they might benefit by such costly experimenting.

In 1908 the United States War Department started an aerial squadron by purchasing from Thomas S. Baldwin for $10,000 a tiny airship of the flexible type. In 1909 the British government appropriated nearly $400,000 for aeronautics. At the same time, Germany was working along this line and in 1910 Count Zeppelm had his first passenger machine ready.

In 1919 the English R-34[5] made the first non-stop flight

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[1] Davy, M. J. B., -op. cit.- P. 14
[2] Keir, M., -op. cit.- P. 332
[3] Keir, M., -op. cit.- P. 333
[4] Ibid
[5] Miller, The World in the Air, Vol. II, P. 279

across the Atlantic; in 1924 the Los Angeles flew from Friedeickshafen, Germany, to Lakehurst, New Jersey, without stopping. In 1926[1] Amundsen flew the Norge across the north pole.

It is difficult to determine just how much Langley contributed to aeronautical success. The practical was so mixed with the impractical that the fraction of error made his experiments catastrophes. By exhaustive tests, Wilbur Wright dissected the theories of these pioneers and valuated their worth.

Langley's "aerodrome",[2] as it was then called, which crashed into the Potomac at Washington, D. C., was repaired and flown in 1914 by Glenn H. Curtis. Curtis became associated with Dr. Alexander Graham Bell and others at Hammondsport, N. Y., and built there the first hydroaeroplane. This plane was the forerunner of the seaplanes now in use.

Flying exhibitions in America began in 1909. Some efforts were made to apply the airplane to commercial uses for passenger carrying, mail carrying, and forest fire detection, but these projects were not put upon a serious and efficient basis until after the war.

The Wright brothers, Wilbur and Orville, two men of remarkable characteristics, achieved the realization of power flight. They investigated all the old theories of flight and eliminated guesswork by patiently adding, subtracting, modifying, changing again and again until they had developed that "wonderful thing" which has invaded Newton's laws and which has revolutionized transportation.

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1. Miller, - op. cit. - P. 293
2. Miller, - op. cit. - P. 75

Until 1908, the Wrights flew only in private, but during the summer of that year they began to give public demonstrations. During the same year the United States War Department accepted delivery of a Wright biplane, the first military airplane in the world and the first airplane to be operated by any government. When the United States entered the World War, it found the Allies and the Central Powers not only battling in the air but also competing in airplane construction and flight training. By the end of the war this country had built nearly 17,000 planes, taught 10,000 men to fly, and trained thousands of men in the construction of aircraft.

After the armistice was signed, the extraordinary demand for planes and pilots ceased. Some of the military pilots returned to their former callings, and others preferred to keep on flying. They toured the country individually or with circuses and later developed the business of carrying sight seeing passengers, giving instruction to students, and transporting persons or merchandise in emergencies calling for speed.[1]

The final impetus[2] needed to establish public confidence in the future of aeronautics was provided by Lindbergh and by other airmen in 1927. Funds became available for existing aeronautical projects, new companies were formed, and existing corporations were bought or merged until the industry now presents the appearance of strength. Aerial passenger lines were established in this country and in Europe, and aerial mail service was successfully inaugurated.

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1. United States Department of Commerce, Civil Aeronautics in the United States, P. 3
2. National Aeronautical Magazine, The, October 1935, P. 16

CHAPTER II

WORLD AERONAUTICS IN GENERAL

It has been said that since aviation constitutes the speediest means of transport, it should serve commerce as a whole. In some countries where the railway system is not yet so developed as to allow complete economic exploitation of the country, the air is not only the quickest, but it is also the cheapest means of communication. In oversea trade, in particular, aircraft is becoming the principal factor in the development of world trade in general.

"Commercial aviation is that branch of aeronautics in which aircraft are employed to carry passengers or goods for profit."[1] So far, the cost of each pound mile for aircraft transportation is very much greater than on railroads or steamship, but the speed is from five to ten times as great, therefore those who put a premium on speed will use air transportation.[2]

"At the beginning of 1935 the United States had the fastest and most efficient airplanes in the world,"[3] but it still lacked a comprehensive national aviation program.

During 1934 the foreign aircraft industries received from their new governments fresh inspiration. No such benevolence and interest was shown aviation by the government of this country until Congress finally recognized this need by authorizing the appointment of the Federal Aviation Commission

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1. Mitchell, Skyways, P. 107
2. Pacé, Modern Aircraft, P. 1
3. The Aircraft Year Book, 1935, P. 11

to recommend a constructive program. This Commission was the first group of its kind to study and report on all branches of aviation since the Morrow Board rendered its report in 1925. At that time there was very little existing aviation for the Morrow Board to consider in forming a definite planned program for the future, but as a result of its recommendations, Congress adopted five-year programs for the development of the army and the navy air forces and a definite program for civil aeronautics under the jurisdiction of the government.

From 1927 until the end of 1932 there was continuous development in all branches of aviation. At the end of 1932 all informed persons realized that new programs were essential if American aviation was to make continued progress. No new program was attempted. It is hoped that the report of the Federal Aviation Commission will become, in the near future, the basis for a comprehensive national aviation program.[1]

The members of this Commission are Clark Howell, Chairman; Edward P. Warner, Vice-Chairman; Albert J. Beves, Dr. Jerome C. Hunsaker, and Franklin K. Lane, Jr. with J. Carroll Cone, Executive Secretary. The Commission immediately organized a statistical and research department in charge of Joseph T. Harlson and J. Howard Yeomans. The Commission's work was summarized in a report of 254 pages with 102 specific recommendations. It offered Congress an admirable foundation on which to build a great national aviation program.

Nearly all air transport routes in Europe have been aided by direct financial subsidies from their respective governments for several years, but such is not the case in America.

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1. Aircraft Year Book, -op. cit.- P. 12

Such subsidies would assure well-trained pilots, satisfactory airports, emergency landing fields, and a healthy aircraft construction industry. The subsidy method enables the air transport companies to forge ahead.[1]

Nearly all of the larger European airports have designed their buildings of pleasing architecture which gives the impression that commercial aviation has come to stay. The airport buildings in this country give little attention to architectural appearance. Some of our airport structures resemble factory buildings rather than passenger terminals.

Europe has specialized in the development of passenger routes. America has taken the lead in night-flying for the transport of mail.

In the northern portion of the United States where severe weather prevails, it is customary for mail routes to be flown in winter as well as in summer while in northern Europe many of the passenger routes are suspended during the winter months.[2]

In Canada winter flying is facilitated by using skis, and many remote places in the north-west are easily accessible by airplanes.[3] "During the past two years 11,000 pounds of freight has been transported by Canadian Airways, chiefly to the northern mining areas. Aeroplanes employed in Canadian "bush" flying are seldom under cover. Through summer and winter blizzard they stand exposed to the elements. During winter operations "nose hangars" are utilized to afford protection to the engineers working on the motors.

"The white caps curl, the chill north wind
Whips from their crests the frozen spray,
Till strut and spar for motion framed
Are sheathed in glittering tracery."[4]

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1. Hanks, International Airports, P. 3
2. The Aircraft Year Book, -op. cit.- P. 12
3. Hank, - op. cit.- P. 4
4. Canadian Airways Ltd., The Bulletin, P. 7

The British have taken the lead in two-way radio communication with airplanes while in flight. This eliminates a hazard which formerly caused airplanes to turn back or land even when their port of destination was clear of fog. The Germans have adopted a similar system.

The simplicity of the airport management methods in Europe is of interest to the American tourist. There is no shouting, nor waving of flags. When the scheduled departure minute has arrived the central office in the tower merely directs a beam of light toward the pilot if the field is clear for him to taxi out to the starting point.[1]

"International barriers in Europe appear to be set aside. For example Dutch airplanes flying from England to Holland pass over France and Belgium."[2]

"No instrument is more effective than the airplane in establishing trade ties with the vast Latin American market that was unceremoniously dumped into the lap of Uncle Sam when Europe went to war in 1914. It is an area in which Americans have invested more than six billion dollars, and, in which, in normal years, we do an annual business of more than two billion dollars.

"Uncle Sam's prestige in South America is now upheld through Pan American Airways by the largest and most efficient air transport system in the world. Its lines both circle and bisect the Caribbean, extend entirely around the South American continent, and link with the United States thirty-two countries and colonies in the western hemisphere. Of the twenty-one

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1. Hanks, -op. cit.- P. 5
2. Hanks, -op. cit.- P. 6

South American republics, only Bolivia and Paraguay are unconnected with the United States by Pan American.

"Over its 22,660 miles of highly organized, radio-equipped airlines, a fleet of more than one hundred airlines carrying mail, passengers and express, maintain schedules with 99.81 per cent perfect regularity. Such an astonishing operating ratio is unapproached by any other airline in the world."[1]

"Medical service throughout some 250,000 square miles of interior Australia has been for several years furnished by airplanes. The area of the flying practice is equal to that of Germany, Austria, Switzerland, and Denmark combined. Contributions toward the service have come from employers and employed, from private donors, and from government subsides.

"Thus with the help of modern invention, a mantle of safety for whites and aboriginals alike, has been spread over a territory equal to half Europe."[2]

"The United States has reciprocal agreements with Belgium, Canada, Germany, Italy, Norway, Sweden, and Union of South Africa, and a tentative agreement with Great Britain which includes a provision seeking to insure the airworthiness of aircraft exported or imported. To expedite exporting to these countries, and to others as well, the Aeronautics Branch issues certificates of airworthiness for export for aircraft that are approved for the purpose. The certificate does not assure acceptance of the aircraft by a foreign country with which the United States does not have a reciprocal agreement,

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1. Worlds Work, July, 1932
2. The Literary Digest, January 28, 1933

but it is a guaranty to the officials of another country that the products meet the airworthiness requirements of the United States."[1]

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[1] United States Department of Commerce, -op. cit.- P. 24

CHAPTER III

EFFECT OF WORLD WAR ON AERONAUTICS

During the World War planes, balloons, and airships were improved rapidly under the pressure of immediate need. Flyers were trained under the same terrific pressure of time, often in twenty or thirty hours of actual flying. For scouting, mapping the enemy's country, clearing the way before a big attack, aircraft were invaluable. They added to the efficiency and to the horrors of war. Dirigible raids, scouting for submarines, balloon observation, aerial battles--these were new acts in the exciting drama. In the war aviators did not carry parachutes. They used machine guns which they had to reload while maneuvering for position. They learned to dive at 300 miles an hour, to do "aerobatics" of the most complicated sort. Such great names as Guynemer, Rickenbacker, Luke, Vaughn, Springs, and Landis made "history in the air" before the armistice.[1]

The World War made people aviation conscious. At the close of the war each country found itself flooded with aircraft, and the manufacturers looked around for means of relief. The war had shown the military utility of the airplane, but peace time utility had not been demonstrated. An impetus in the industry was needed to show the public the reliability of airplanes and air flight, and Lindbergh supplied this need. Lindbergh was not the first man to cross the Atlantic; in fact, he was the tenth man to make the transatlantic flight.[2] (A schedule of the early transatlantic flights is given on page 17.)

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1. Dobias, The Picture Book of Flying
2. Judson, Albert N., Popular Aviation, January, 1936, P. 31

A SCHEDULE OF THE EARLY TRANSATLANTIC FLIGHTS

ORDER	Commanding Pilots	North or South	Date	Name of Plane	Dist. in Miles	Elapsed Time
1	Commander Read, Crew......	NA	May 16, 1919	NC-4............	4,791	53:58:00
2	Brown (Eng.), Alcock (USA)	NA	June 14, 1919	Vimy-Vickers....	1,890	16:12:00
3	Major Scott..............	NA	July 2; 19	R-34 (Dirigible.	3,270	108:12:00
4	Cabral-Coutinho...........	SA	Mar. 30, 1922	....	3,750	....
5	Around the World Flyers...	NA	July 17, 1924	Chicago-New Orl.	2,850	39:23:00
6	Franco & DeAlda...........	SA	Jan. 22, 1926	NePlus Ultra....	3,879	37:25:00
7	de Barres & Cunha.........	SA	Apr. , 1927	Jahu............	3,519	....
8	de Pinedo & del Prete.....	SA	Feb. 19, 1927	Santa Maria.....	2,290	....
9	de Beires.................	SA	Mar. 16, 1927	Argos...........	1,560	17:30:00
10	Chas. Lindbergh...........	NA	May 20, 1927	Spirit of StLouis	3,620	33:29:00
11	Chamberlain & Levine......	NA	June 4, 1927	Columbia........	3,930	42:00:00
12	Commander Byrd............	NA	June 29, 1927	America.........	3,490	40:00:00
13	Brock & Schlee............	NA	Aug. 27, 1927	Pride of Detroit	2,350	23:21:00
14	Costes & LeBrix...........	SA	Oct. 14, 1927	Nungesser-Coli..	1,980	18:05:00
15	Huenfeldt & Koehl.........	NA	Apr. 12, 1928	Bremen..........	2,070	37:00:00
16	Stultz & Earhart..........	NA	June 17, 1928	Friendship......	4,449	20:40:00
17	del Prete.................	SA	July 3, 1928	....	4,450	51:59:00
18	Jiminez...................	SA	Mar. 2, 1929	Jesu del-Poder..	4,067	44:00:00
19	Assolant & Lefevre........	NA	June 13, 1929	Yellow Bird.....	.....	29:52:00
20	Williams & Yancy..........	NA	July 8, 1929	Pathfinder......	.....	....

The achievement of Lindbergh, therefore, was not so much the accomplishment of the deed as it was the awakening in the minds of the people of the tremendous possibilities of the air and of the replacing of tolerance with absorbing interest and respect.

Today the people in every country are opening their eyes to facts, not dreams. "The vast possibilities in aviation, hereto inconceivable, the commanding portents of rapidly growing air armaments of all nations, the beneficient influence of air transportation in our orderly commercial development finally are finding a place in our national consciousness. Now, for the first time millions of people have come to realize that in the air will be enacted the next great scene in the drama of national progress. Many factors have contributed to a better public state of mind--new achievements, the lure of the airline, the army air corps, naval flying, and a lessening fear of the new adventure, have recently served as signal aids in aviation."[1]

"The cessation of the war left America with a well-developed airplane industry that was equipped with numerous factories, well tooled and organized to manufacture military airplanes and engines. Aircraft had accomplished so much in the war that aviation enthusiasts looked forward to a general and wide application of aircraft, especially airplanes and seaplanes to commercial transport purposes. Unfortunately few of the airplanes adapted for use in military services were of any value in industrial applications.

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1. The National Aeronautic Magazine, August, 1935, P. 22

"War-time surplus airplanes were purchased from the government and were used for pleasure and "thrill" trips by those who wished to make money at the expense of the people who wished to experience the novelty of flying."[1]

"In Europe various airlines were established with the aid of government subsidies and could not have been operated without this financial aid. In this country, no government subsidies were given operating companies, so those who started found that the difference between operating costs and income was too great to permit profitable operation.

"In Europe after the World War experience in aviation was turned to account commercially by the establishment of regular passenger airplane service. Air lines connected England and France, and London and Amsterdam, Paris, Berlin and Vienna soon became centers for radiating passenger air lines and in 1923 time tables and schedules were published for European air lines.

"The first important passenger airlines in the United States were installed by the Aeromaune Airway's and were coastwise hydroplanes connecting the North and South Atlantic ports, and mainland points with outlying islands. Planes were employed as forest patrols, in spreading smudges to kill forest-insect pests and in seeding inaccessible areas. In the South the attempt was made to destroy the boll weevil by airplane gas screens. Planes were found useful in mapping various parts of the United States. Seaplanes have been used to scout fish schools for the fishermen and to drive off the

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[1] Pacé, -op. cit.- P. 686

larger preying fish from schools of fish that are sought for the market. By 1925 the usefulness of airplanes for fast freight and express was admitted by the inauguration of several regular airlines.

"The Fords started a daily service between Detroit and Chicago, and there were other lines running from Cleveland, Dayton and Cincinnati. The Standard Oil Company of Indiana adopted airplanes for its intercompany mail and express in ten Middle Western states. The airplane in commerce was a fixture by 1925. In that year the first dining car was installed in the London-Paris airliners, a hobo rode on the wing of a plane from Las Vegas to Los Angeles, a thief stole a plane at Sioux City, a Lascar diamond merchant was murdered on a plane while riding to Budapest, and a New York department store carried airplanes in stock for sale."[1]

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[1] Keir, M., -op. cit.- P. 345

CHAPTER IV

NATIONAL ADMINISTRATIVE ORGANIZATION

During the Great War, questions concerning aviation were dealt with by the Ministry of War. With the development of national consciousness in aviation after the war came the realization of the fact that an authority inspired by military considerations was not advisable. Most countries and particularly those which have advanced in commercial aviation have placed civil aviation under a civil administration.

"The Ministry of War, or, most often a special section of this Ministry, is still exclusively responsible for civil aviation in the following countries: The Argentine (Ministry of War and the Marine, with a Directorate for Civil Aviation); Chile (Ministry of War with Aviation Department); Yugoslavia (Ministry of War and the Marine); Canada (Ministry of National Defense with a Directorate for Civil Aviation); Columbia (Ministry of War); Cuba (Ministry of War); Norway (Ministry of National Defense); Peru (Ministry of the Marine and Aviation); San Salvador (Ministry of War); Siam (Ministry of War); Turkey (Ministry of War); Uruguay (Ministry of War and the Marine)."[1]

The following countries have worked hardest to develop aviation and have placed commercial aviation under a civil ministry: "Egypt (Ministry of Transport and Public Works); Belgium (Ministry of Transport); Bolivia (Ministry of Railways and Transport); Brazil (Ministry of Transport and Public

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[1] League of Nations, Enquiries into the Economic, Administrative, and Legal Situation of International Air Navigation P. 99

Works); Bulgaria (Ministry of Railways, Posts and Telegraphs); China (Ministry of Railways); Denmark (Ministry of Public Works); Germany (Reich Ministry of Transport); Estonia (Ministry of Transport); Finland (Ministry of Transport and Public Works); Greece (Ministry of Transport); Guatemala (Ministry of Public Works); Japan (Ministry of Transport); India (Ministry of Public Works); Ireland (Ministry of Industry and Trade); Latvia (Ministry of Transport); Lithuania (Ministry of Transport); Mexico (Ministry of Transport and Public Works); The Netherlands (Ministry of Public Works); Austria (Federal Ministry of Trade and Transport); Poland (Ministry of Transport); Portugal (Ministry of Trade and Industry); Roumania (Ministry of Industry and Trade); Sweden (Ministry of Transport); Switzerland (Federal Department of Posts and Railways); Union of South Africa (Postmaster-General); Czeckhoslovakia (Ministry of Public Works); Hungary (Ministry of Trade); United States of America (Department of Commerce, Aeronautics Branch)."[1]

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1. League of Nations, -op. cit.- P. 99

CHAPTER V

PRINCIPAL AIR SYSTEMS OF THE WORLD[1]

The United States

Scheduled Air Line Operators

Domestic

American Airline, Inc.	420,753,250	332,904	31,131,202
Bowen Airlines, Inc.		8,746	2,367,752
Braniff Airways, Inc.	76,826,429	35,118	690,706
Central Airlines, Inc.	27,850,764	27,697	888,108
Chicago & Southern Air Lines Inc.	17,312,493	34,942	435,179
National Airways, Inc.	1,595,053	303	834,655
National Parks Airways, Inc.	13,701,887	6,008	387,672
North American Aviation, Inc. (Eastern Air Lines Division)	361,711,264	145,081	17,593,746
Northwest Airlines, Inc.	44,081,439	19,808	4,381,194
Transcontinental and Western Air, Inc.	953,552,011	157,616	36,390,055
United Air Lines Transport Corp.	2,314,210,157	1,095,593	82,209,198

Foreign

American Air Lines, Inc. (New York to Montreal)		47,033	331,634
National Airways, Inc. (Boston to Montreal)		128	226,123
Northwest Airlines, Inc. (Pembina to Winnepeg)		101	6,813
Pan American Airways, Inc.		1,063,061	30,482,105

Territorial

Alaska Southern Airways, Inc.			35,547
Inter-Island Airways, Ltd.	542,811	32,788	1,347,751
Pan American Airways, Inc.	542,811	32,788	1,383,298

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[1] U. S. Department of Commerce, Air Commerce Bulletin, May 15, 1935, P. 261-265

Largest Unit and its Transport Operating Subsidiary

The foregoing list of scheduled air transport operations proves that America possesses a stable, progressive, and well-organized industry, and that travellers by air are surpassing the half-million mark. The story is continued in the following material:

"The aviation industry is no colossus but by some millions its largest unit is United Aircraft and Transport. United Air Lines is its transport and operating subsidiary. World's busiest line, its planes flew 13,074,000 miles in 1932 (45,770,000) passenger miles--nearly one-third U. S. total--over 5,835 miles of route. Its nearest rival will be the new General Motors group which expects 12,000,000 plane miles in 1933. From fares, United collected $3,000,000, from mail revenue $6,960,000.

"The route of United Aircraft lines stretches across the Continent from New York to San Francisco, through Chicago, forming a T at San Francisco; the top of that letter has ends at Seattle and San Diego. Another line is from Salt Lake City to Pasco, Spokane and Portland; and there is still another branch from Chicago to Kansas City and to Dallas.

"Pan American is the great United States line which circles the whole continent of South America, operates in Alaska, and soon will in China--over 25,000 route miles in thirty-two countries--by far the longest system in the world (Imperial Airways: 15,000 miles). But Pan American flew only 4,700,000 plane miles last year--less than the least of the Big Three. Although every important domestic line runs Pan American stock,

working control is in the hands of Cornelius Vanderbilt Whitney and President Juan Terry Trippe."[1]

Specific Information Concerning Air Systems

Detailed information on the air line operators will be given below:

"At this time there are twenty-three transport companies whose craft display the NC denoting American commercial registry. Of these, twenty operate lines within the borders of the United States: five fly to Canada and Latin America. (Both foreign and domestic services are maintained by two companies.)

"The twenty-three companies offer service over 44,237 miles of routes, and the airplanes are scheduled to fly a daily average of 139,629 miles divided as follows: Domestic operations, 24,878 miles of routes and 11,327 airplane miles scheduled daily."[2]

Mergers and Independents

As the aviation industry widened, and companies grew and prospered, financial maneuvering developed. Favorable earnings, together with the prospects of a great increase in the demand for aviation products had attracted an abundant supply of capital and many new competing companies began to enter the field. "Easy credit and financing associations had made it attractive for companies in various localities and branches of the industry to consolidate thus bringing together independent financial structures producing plants, operating

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1. Fortune, May, 1933, Air Travel in the U. S., 1933, P. 28
2. United States Department of Commerce, -op. cit.- July 15, 1934, P. 4

equipments and personell in the creation of fewer but more important aviation enterprises.

"There were several reasons why consolidation was advisable. In the first place, a structure built upon the issuance of securities for a present company would simplify the financial structure of the companies involved. Furthermore such a combination would afford less competition among a larger number of small producers and operators, and it would tend to allow greater economics in production, a stronger buying power and presumably larger earning which would result in a stronger financial position. Again, consolidation would make possible an effective national sales and service organization; also it would make possible an adequate credit or instalment financing structure.

"Finally consolidation was found advisable from the operator's viewpoint in order to bring together the large numbers of short air mail and passenger lines into several national airways, thus greatly increasing the value of the transportation services rendered to the public.

"It is not unnatural then, that a remarkably short but intense period of consolidation has been witnessed. The holding company has sprung up to act as the parent for groups of subsidiary companies. In some instances manufacturing companies joined accessory or auxilliary companies with the holding company as the superimposed financial structure. Again, some manufacturing and engine companies joined operating companies, while still others joined training schools or airport companies.

"These consolidation movements within the aviation industry, as with most industries, have been closely guided by financial institutions."[1]

"During April, 1933, four groups of stockholders were polled to confirm the final moves in a year's complicated planning. The merger confirmed, General Motors, through its 40 per cent owned General Aviation, will control (1) TWA, (2) Eastern Air, and (3) Western Air Express (a large ex-independent). In 1933 the new combination expect almost to match United's 13,000,000 miles flown, for TWA and EAT were both members of 1932's Big Four in their own right:

"TWA which calls itself the 'Lindbergh Line' (because Lindbergh mapped it) began 1929 as a 48-hour air-and-rail service of Transcontinental Air Transport. A 1930 merger brought General Motors into the picture. Last year TWA finally achieved enough government contracts--after losing $5,000,000. Revenue for 1932: from passengers $1,000,000; from mail contracts $3,1000,000. Miles of airway: 4,268; miles flown: 5,105,000 (13,500,000 passenger miles).

"EAT: in 1930 Harold Pitcairn, Philadelphia socialite, sold his east-coast line at a profit and turned to autogiros. The buyer was North American Aviation. Last month General Motors stepped in; a few weeks before, the line had absorbed its famed-non-mail-carrying competitor, the Ludington Line. Last year EAT collected $804,000 from passengers, $1,700,000 from mail, lost money. In 1932, miles of airways: 3,100; miles flown: 3,700,000 (16,650,000 pas. miles).

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1. Dodd, Paul A., Financial Policies in the Aviation Industry, 1933, P. 112

"American Airways' 70 separate operations have merged since 1929. Launched by the Lehmann Bros. Harriman banking group, Errett Labban Cord, the automobile man, recently gained complete control. With the longest route (11,274 miles), its total miles flown in 1932 was 12,363,000 (22,000,000 passenger miles). American Airways has lost money since birth. Last year's revenue: passengers, $1,423,000; mail (with ten of the twenty-four domestic contracts), $5,184,000.

"The largest 'independents' usually refers to the eighteen non-mail carriers, the largest of which are Bowen (San Antonio--Tulsa) and Braniff (Oklahoma City--Chicago)."[1]

By this coordination of activities "a certain element of competition is eliminated. It is true that the airlines will compete with one another and seek to maintain their equipment at the highest level, and that the American transport plane is making wonderful strides. Nevertheless it will be just a trifle harder for new ideas to break in.

"It may be pointed out in justification of this coordination policy that the aviation industry has stood the depression far better than most other industries. Traffic over the airlines has grown consistently: It is current gossip that profits are being made by the operating units, and that general prospects in the industry are now sounder than ever before."[2]

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[1] Fortune, May, 1933, P. 28
[2] The Scientific American, July, 1933, P. 32

Activity of Regular Air Lines

The American public has become air-minded in a substantial way. During the summer of 1935 ticket offices reported that a waiting list for space on air liners was a frequent experience. Existing facilities were taxed to capacity, and extra sections were run on many long routes.

"The Bureau of Air Commerce of the Department of commerce reported that schedule air lines in June carried 73,896 passengers and flew 4,993,328 miles, setting a record. It also reported that new records had been set for passenger miles and express.

"The highest monthly total for passengers carried in any one month previous to June of this year was 65,409 in August, 1931. The nearest approach to June's record of mileage was 4,868,717 miles flown in July, 1933. Reports from air lines indicate that July and August of this year may well pass the June marks when the statistics are in.

"For the six months' period, January through June, a total of 319,484 passengers were carried in the twenty-two major air lines, in contrast to 191,088 for the same period in 1934."[1]

Brief summaries of reports from prominent air lines as to their passenger business follow:

United Airlines--A twenty per cent gain for the first seven months over the same period last year.

Transcontinental and Western Air Inc.--Unprecedented demand for spare during vacation period.

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1. The National Aeronautic Magazine, September, 1935, P. 25

Bowen Air Lines--Majority of the passengers are furnished by the oil industry traveling to and from the mid-continent oil fields. There are more travelers to Mexico than ever before. There are more tourists than ever before.

Boston-Maine Airways, Inc.--"On the Maine line, extending from Boston to Bangor, seventy-five per cent of passengers this summer are tourists, while on the Vermont division from Boston to Burlington tourists make up only thirty per cent of. the traffic load. Both lines show an increase in travel, with the Vermont division attracting principally business men on commercial trips."

Delta Air Lines--Steady increase in passenger traffic since the inauguration of the service in August, 1934.

Eastern Air Lines--One hundred per cent more passengers are being carried out of New York over same months last year. Gross revenue eighty per cent over 1934.

Pan American Airways, Inc.--"The traffic figures recorded during May, June and July are indicative of increased commercial activity rather than a reflection of increased tourist travel. Passengers registered a sixty-seven per cent increase in May, a fifty-nine per cent increase in June, and sixty-nine per cent in July, over the same months of 1934.

Pennsylvania Airlines--"In July passenger business soared 264 per cent over July of last year, 5,047 passengers as against 1,383."

Central Airlines--"Because of the change in equipment and service, volume of traffic business will not be accurately reflected for several months."

American Airlines, Inc.--"This year promises to be the biggest year in the history of this service."

National Parks Airways, Inc.--Increased tourist business.

Braniff Airways--Increased passenger business. In December, 1935 the report for the fall season became available.

"Scheduled air transportation in the United States during September was marked by a seasonable decrease, but the 77,370 passengers carried was considerably in excess of 1934 figures when 45,248 passengers flew. The total number carried in August, 1935 was 89,581 the peak of American airline traffic for all time. Passengers carried during the first nine months of the year were 635,190 or more than the entire total last year."[1]

"There were increases in the amount of express carried and the express miles flown in September as compared with the preceding month. Express totaled 417,223 pounds and 229,094,192 express pound miles were flown.

"Passenger miles were 32,023,693 and miles flown were 5,360,092.

"Reflection of this tremendous traffic is seen in United Air Line's reports for the first nine months of the year. Increases of 24 per cent in passenger traffic, 52 per cent in express, and 85 per cent in air mail were reported for that period as compared with the first three quarters of 1934.

"Carrying 140,160 revenue passengers, United showed an increase of 26,855 passengers over the total of 113,294 passengers in the same period of 1934. United transported

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[1] The National Aeronautics Magazine, September, 1935, P.25-29

an aggregate of 1,182,229 pounds of air express in the nine-month period, an increase of 403,072 pounds over the total of 779,157 pounds in the corresponding three quarters of the previous year.

"Air mail on United between January 1 and September 30 totaled 3,718,097 pounds, an increase of 1,675,048 pounds over the 2,043,049 pounds transported in the corresponding period last year. It was pointed out, however, that the 1934 figure was proportionately smaller as the company did not carry mail for almost three months during 1934 due to air mail contract cancellations."[1]

Aeronautical Equipment of the Country

The September, 1935 issue of The National Aeronautic Magazine gives a glowing report of the aviation industry during the first eight months of the year. To quote: "Not only the commercial airlines, but the manufacturers as well, are working at top speed. Most-encouraging reports come from Curtiss-Wright in the east to Boeing in the west. Last year the civil aeronautics industry in the United States produced aircraft, engines, equipment and spare parts valued at $44,144,448, and furnished employment for more than 18,000 persons according to the Department of Commerce. The present outlook indicates that this figure will be easily exceeded."[2]

From the Aircraft Year Book for 1935 comes an encouraging report: "Total of original privately financed investment in the aeronautical industries almost all of it put in between 1927 and 1929, appears to have been some $550,000,000. To

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1. Aero Digest, December, 1935, P. 47
2. The National Aeronautical Magazine, September, 1935, P. 22

that add $90,000,000 for investment in municipal airports. There remains some $180,000,000 of current value in commercial activities.

"15,000 men and women are now employed in the manufacture of aircraft--engines, parts and accessories; 12,000 in the operation of air lines, airports and flying services; 34,000 in government aviation services; 61,000 gainfully employed Americans find aviation their chief vocational interest."[1]

Possible Air Lines Across the Atlantic

The activities of Colonel Lindbergh in mapping and surveying possible air lines have been reported at various times. "Writing in Aviation, the well-known pilot, Roger Q. Williams, ably discusses the question of the three alternative routes as drawn on a map prepared by the topographical Survey of Canada.

"There are a number of problems which have to be solved before scheduled service across the Atlantic can be counted upon. Adequate flying equipment must be provided with sufficient useful load, over and above the huge fuel load, in the form of passenger, mail or express to give the possibility of commercial exploitation. Flying speeds must be stepped up to offer the greatest possible advantage over fast and comfortable steamers. Problems in navigation and radio aids have to be thoroughly considered. Piloting personnel of long experience in ocean flying will have to be highly trained. Weather hazards must be met, particularly in winter flying in the north. Engine reliability has to be practically perfect.

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[1] Aircraft Year Book, 1935, P. 52

Engine failure followed by a forced landing in mid-ocean will always be hazardous.

"The southerly route from New York to Portugal via the Bermudas and the Azores has much to recommend it. It is an all-year course with almost ideal flying conditions. The average temperature is around 70 degrees, Fahrenheit, which is just right for both passenger and engine. The longest water jump, 2,000 miles between the Azores and Bermuda, is approximately the same as the distance over the water between the Newfoundland and Ireland, but without the fog conditions to be found on the more northerly route. Also, the New York to Portugal flight is a two-way trip. Airplanes can go either east or west without waiting for ideal winds. The difficulty with the route is that it is 4,000 miles long, 600 miles longer than the Great Circle route from New York to London.

"Nevertheless, the southerly route is infinitely preferable to the shorter Great Circle airplane from New York to Halifax, Newfoundland, and then to Ireland. Here fogs, storms, and winds form great hazards and since the water jump is still 2,000 miles--a great bar to commercial payload--it may be authoritatively said that the Great Circle route cannot be preferred to the southerly route for many years to come.

"When we come to the Arctic route, New York--Halifax--Labrador--Greenland--Iceland, the survey of which Lindbergh is now concentrating on, we find a number of difficulties. The total distance on this Arctic flight is 5,200 miles, which is a serious handicap for speedy operation. Fogs, storms, cold, snow, bad landing facilities on water and on land resulting from freezing conditions for a larger part of the year are

other difficulties. Darkness for 22 hours daily may be expected for six months of the year. In the case of a forced landing, the Eskimos must be depended upon for shelter and held. The greater part of the region flown over on the route is barren waste land, and ice floating upon the sea. The great advantage of the Arctic route is that it has ten refuelling stops and no long water jumps.

"Williams, a competent Atlantic flyer, favors the southerly route. Pan-American evidently favors the northerly route.

"It can be seen what tremendous importance Colonel Lindbergh's present expedition has for the future of transatlantic transportation. He is perfectly aware of all the difficulties and his report, supplemented by investigations made by Pan-American Airways and various expeditions to Greenland and Labrador, will give the last word on the subject. If his findings are favorable, Pan-American hopes to put its large flying boats, now under construction at the Glenn L. Martin and Sikorsky plants, in operation by the spring of 1935."[1]

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1. Scientific American, October, 1933, P. 174

The Dominion of Canada

The year 1935 has been one of advancement in Canada. New services have been inaugurated new bases opened, and other events of importance have occurred.

The Air Annual of the British Empire, 1934-5 gives the following information:

"Aeroplanes operated by Canadian Airways, Ltd., last year on mail services flew a total of 2,128 hours as against 3,370 hours in 1932 and 12,447 in 1931. In other than mail services the company's aeroplanes flew 9,489 productive hours in 1931.

"The total mileage flown in mail services dropped from 1,336,107 miles in 1931 to 210,666 miles in 1933, while in other services there was an increase during the period from 496,687 miles to 954,769 miles. Goods and mail transported last year amounted to 2,850,852 lb., as compared with 2,169,202 lb. in 1932 and 1,223,908 lb. in 1931. The number of pound-miles increased during the same period from 173,895,707 in 1931 to 344,704,550 last year. Passengers carried last year numbered 16,942 covering 1,094,600 passenger miles, as compared with 8,963 passengers covering 998,619 passenger miles in 1932, and 8,047 covering 111,628 passenger miles--1931.

"Despite the curtailment of air mail services by the Government during the past two years, there was an actual increase of 10 per cent last year in the volume of mail carried, and of 35 per cent in the volume of freight and express---

"Canadian Airways, Ltd., concluded its fourth summer flying season in the Great Bear Lake area since the discovery of radium ore there. Flying revenue has increased by 50 per cent during the past three years concurrently with a decrease of 50 per cent in fares and freight rates.

"The company flew in the MacKenzie River area during the months of January-October, 1933, a total of 313,135 miles, carrying 42,524 lb. of mail and 396,846 lb. of express packages. The number of passengers carried totalled 812 passenger miles numbering 285,076.----

"Present flying rates per passenger are about $375 for the return journey from Waterways to Great Bear Lake.

"Canadian Colonial Airways, Ltd., have been operating on air mail and passenger service from Montreal to Albany since 1st. October, 1928. Connections are made at Albany with American Airways' planes to New York, Boston, Syracuse, Rochester, and Buffalo. The policy of the company from its inception has been that of offering a safe and reliable service to the public.

"It has been gratifying to note that not only has the amount of mail carried been on the increase but there has also been, year by year, a substantial increase in the number of passengers carried. In order that the safety factor shall remain at its highest, only pilots and air engineers of long experience are employed and all modern aids to air navigation are used.

"An air service south from Montreal to Albany, particularly during the winter months is somewhat of an unusual one

in that with a great deal of snow at Montreal and practically none at Albany, the company has been forced to operate off wheels during the entire year, in spite of the snow at Montreal. This has been made possible chiefly by the active cooperation of the Government in keeping clear the hard surface runways of the St. Hubert Airport. Excellent service has always been rendered this company at the St. Hubert Airport.

"The number of passengers carried over Canadian Colonial Airways, Ltd., is less during the winter months than during the summer, and one factor governing this is the fact that the general public does not yet seem to realize that flying in winter is quite as enjoyable as flying during the summer. The cabin planes used are very comfortable and are kept at a temperature of about 65° F.

"During 1933 the company carried 640 pay passengers, and 59,374 lbs. of mail, a very satisfactory increase over previous years.

"Operations of National Air Transport Ltd., during the winter of 1933, were carried on at Gogama, Leamington, and Barker's Field, the company's headquarters at Toronto.----

"At Leamington during the winter, Mr. W. J. Ed. Johnston successfully carried out the air mail operations to Pelee Island and transported along with the mail a considerable number of passengers and a quantity of express, chiefly in the form of groceries."[1]

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[1] Squadron-Leader C. G. Burge, The Air Annual of the British Empire 1934-35, p.p. 83-84.

"Eyes that frame cities where none be."--Emerson

"The Dominion Department of Mines use the aeroplane for geological survey parties. Dominion and provincial officials travel by air when making a rapid survey of the natural resources of the country. Although Canada is a country of magnificient distances yet its uttermost points are less than two days flight from railhead. The innumerable lakes and waterways throughout the mineralized areas are serious obstacles to the construction of railroads and highways--to the aeroplane they afford safe routes and safe landing areas both in summer and in winter."[1]

"There is nothing new about aerial transport, but aerial prospecting for precious metals is something novel, and its technique is peculiarly Canadian.

"It is the boast of Canadian air transport companies that on one or two days' notice they can set down a prospector with a canoe and outfit at any selected point in continental Canada as far north as the shores of the Artic ocean, and that the use of airplanes in prospecting their isolated northern regions has advanced gold mining by decades. As long ago as 1929 three of these companies reported a total of 174,000 square miles explored from the air. Their planes flew half a million miles and carried nearly a million pounds of supplies and equipment for the maintenance of prospecting parties. These activities have increased steadily.

"As a result, Canada has built up a huge air traffic. In 1935 it was 243 per cent greater than in 1934; and nearly

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1. The Bulletin Canadian Airways Ltd., Christmas, 1935, p.p. 2-3

fourteen and a half million pounds of freight and express were carried as against a little more than four million pounds the preceding year. Ninety per cent of this business was in connection with mining. Between 1932 and 1934, freight carryings multiplied four and a half times, whereas United States freight carryings by air showed an increase of only ten per cent. With less than one-tenth of our population, Canada is flying four times as much freight as we are."[1]

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1. Hearsts' International Cosmopolitan for January, 1936, P.104

Central America

Since the United States air system is linked with that of Central America, it is difficult to find separate material of significance.

"The air system of Central America and the Greater Antilles should be considered as part of that with the United States. The principal Mexican lines owe their significance to their linking up with the United States system (both in the case of the tourist lines to the pleasure resorts and in the case of the main traffic lines); in the same way it is owing to the leisured and wealthy population which resides in Florida that the luxury lines going as far as San Juan de Porto Rico are assured of their custom.

"But the true value of these lines is due to the fact that their stopping-places, both on the mainland and in the islands lie along the prearranged routes to South America."[1]

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[1] League of Nations, -op. cit.- P. 27

South America

The Pan American Airways link with the United States thirty-two countries and colonies in the western hemisphere. Bolivia and Paraguay are the only two republics which are not connected with the United States by Pan American.

The speed of the growth of Pan American Airways is remarkable. Although the field is a highly competitive one, yet in three years the company has outstripped not only the independent and national airlines of South America but also the long-established heavily subsidized French and German international services as well.[1]

"The first of these--the Compagnie Générale Aéropostale--was founded a few months after the Armistice by Pierre Latécoére with the assistance of the French government, which granted both a monopoly and a subsidy to Aeropostale in order to revive French commercial contacts in Africa and South America. Purchased in 1925 by Marcel Lafont, noted Franco-American capitalist, Aéropostale now operates under subsidy a 7,500 mile mail and express line from Paris to Buenos Aires and Santiago do Chile, via Toulouse, Barcelona, Tangiers, Dakar, Natal, and Rio do Janeiro. Between Dakar and Natal, French warships speed the mails over a water hazard that in a few years will be spanned by wings.

"In 1920 what is regarded as the first successful commercial airline in the world was established in Columbia by Peter Paul von Bauer, adventurous former Austrian Army flyer.

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[1] World's Work, July, 1932, P. 49

His concern, the Sociedad Colombo Alemana de Transportes Aereos (Scadta), is now the national air service of Columbia and operates some 1,700 miles of airways. Using German planes and pilots Scadta covers the 630 mile course of the Magdalena River between Barranquilla and Begota in less than a day, supplanting an eight or ten day journey on uncertain river steamers.

"In 1925, Von Barrer, Scadta's chief, made a perilous flight to Washington to solicit a U. S. airmail contract, but the Post Office Department, although admiring his hardihood, patriotically denied the request. In 1931 Pan American acquired a large stock interest in Scadta, and the lines were interconnected.

"German capital and governmental support back operations of the Condor Syndicate, Ltd., which started in a small way on the eastern coast of South America and in Brazil in 1928, only a few weeks behind the French. This syndicate now operates 2,300 miles of air routes in South America in addition to an international mail service. Mail is flown to Natal whence fast steamers carry it across the South Atlantic to the Canary Islands to connect with planes of the Deutsche Luft Hansa (with which Condor is closely affiliated) for the trip northward. Only nine days now separate Berlin and Buenos Aires by this route.

"The Germans virtually sewed up Bolivia aerially in 1925, before Pan American was born. In that year, the centenary of Bolivia's independence, the German Colony at La Paz presented to the Bolivian government a German plane. Shortly thereafter a local company (Lloyd Aereos Boliviano) was formed which,

with the aid of a Bolivian subsidy, has extended its network to cover nearly 2,300 miles.

"Add to this picture a dozen or more national air services--developed by the various governments to greater or lesser degrees of size and efficiency--plus several independent operators and you have the competitive conditions which Pan American faced at the outset in October, 1927."[1]

"The Condor syndicate was to extend its weekly service from Buenos Aires to Santiago, Chile, October 7, when the first 14 passenger Junkers Ju 52 plane was to arrive at Los Cerrillos airport. The return flight was scheduled for October 9. The Condor Syndicate has operated for several years in Brazil and extended its service to Buenos Aires some time ago. This extension, coupled with the German service between the Brazilian coast and Germany, permits air mail carriage between Santiago and Europe in 4 1/2 days."[2]

The Aero Digest states also that "before appropriation bills were passed carrying 22 million pesos for the Army Air Corps and 20 million pesos for the Naval Air Service for the purchase of airplanes and equipment. This sum is to be spent over a three-year period with a provision that not more than 7 1/2 million pesos for either service may be spent in one fiscal year. This program is designed to place the Argentine Air Services in the lead in South American military aviation. The purchases will embrace all types of aircraft."

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1. World's Work for July, 1932, P. 52
2. Aero Digest, December, 1935, P. 68

Europe

Comparison of length of air lines with that of the United States:

"The length of the airlines in Europe is three times as great in proportion to the area of the continent as in America, and approximately the same as in the United States of America."[1]

French Companies

From the beginning the French government has given annual subsidies to aeronautical projects. In 1924 the grant was $2,400,000.[2]

Scheduled air line operators:

"The leading French companies in 1929 were as follows:

"1. The Air Union Kilometrage of airlines, 2,593. Machines in service, 41.

"2. Compagnie general aeropostale. Kilometrage of airlines, 16,650. Machines in service, 200.

"3. C.I.D.N.A. Kilometrage of airlines, 4,119. Machines in service, 75.

"4. S.G.T.A. Kilometrage of airlines, 2,333. Machines in service, 37.

"5. Air Union Eastern Lines. Kilometrage of airlines, 3,254. Machines in service, 9."[3]

Traffic and subsidies between 1920 and 1929:

The approximate traffic receipts of the French companies between 1925 and 1929 are as follows:

"1. The number of kilometres covered exactly doubled

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1. League of Nations, -op. cit.- P. 18
2. Hodgins, Magoun, Sky High, P. 378
3. League of Nations, -op. cit.- P. 8

(4,712,888 as against 9,435,434).

"2. The passenger traffic doubled (12,461,000 passenger-kilometres equivalent to 12,461 passengers each carried 1,000 kilometres, as against 6,279,000).

"3. The parcels traffic increased nearly three times (888,317 kilometre-tons as against 319,359).

"4. The postal traffic increased 23 per cent (313,293 kilometre-tons as against 254,689).

"5. The total traffic expressed in kilometre-tons more than doubled (2,240,020 as against 1,097,298).

"6. The annual subsidies increased more than threefold (162,700,000 francs as against 51,340,000).

"Thus, activity doubled, traffic doubled, subsidies more than trebled (or roughly trebled), as account must be taken of the depreciation of the currency.

"If we compare the subsidies received with the traffic receipts, we see that the latter amounted to nearly one-third of the former (exactly 31.4 per cent) in 1925 and to little more than one-quarter only (26.4 per cent) in 1929.

"The average commercial returns of the concerns have thus fallen during the last five financial years, so that Government assistance has had to be increased, not only absolutely, but also relatively, with the increase in the activity of the companies."[1]

Later traffic and subsidy figures:

"Traffic figures for the first quarter of 1935 reveal that Air France's traffic is considerably ahead of 1934 returns. There was an increase of 7,806 passengers when

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[1] League of Nations, -op. cit.- P. 54

28,879 were carried, mail increased 46,288 lbs. to 278,542, and express poundage reached 1,637,428 lbs., contrasted with 1,522,484 lbs. in the similar period of 1934. The most-traveled route was Paris-London over which 8,216 passengers flew. Next was the Paris-Lyons-Marseilles run which had 4,095 passengers, and the third most popular run, catering to 2,992 passengers, was between Paris and Amsterdam. Other routes, and the number of passengers carried are Marseilles-Tunis, 1548; Marseilles-Algiers, 1523; Marseilles-Cannes, 1004; Brussels-Malmo, 919; and Marseilles-Saigon, 556."[1]

"The air transport lines of France were merged into one combine, Air France, in 1933. Its divisions operating in South America between Argentina and Chile received a subsidy of $3.40 for every mile flown in 1934. The other divisions to European Capitals, North Africa and French Indo China were similarly subsidized. The South American division received a total of about $8,000,000 in subsidies in 1934. Officials in Air France planned to follow the Germans across the South Atlantic with a regular flying boat service in 1935.

"The first of the proposed fleet, the Lieutenant de Vaisseau Paris, was flying on test hops early in 1935, and it appeared that France would establish her service ahead of the British, and also the Royal Dutch Airlines which was planning a transatlantic service to Dutch Guiana."[2]

Air Union:

"The system operated by the Air Union consists for practical purposes of three lines:

"A short aeroplane line: Paris-London (375 kilometres);

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[1] Aero Digest, December, 1935, P. 67
[2] The Aircraft Year Book for 1935, P. 39

"A medium aeroplane line: Paris-Marseilles (730 kilometres);

"A long seaplane line: Marseilles-Ajaccio-Tunis-Bona (1,300 kilometres).

"The first provides a connection of less than three hours between two of the most important capitals, which are almost constant stopping places for tourists, particularly from the United States. At the same time, certain Custom simplifications and also the special suitability of aeroplanes for the transport of fragile objects, have gradually led to the building up of a considerable parcels traffic on this air route. Furthermore, the subsidies enjoyed by the Air Union (like its British competitor Imperial Airways) have made it possible to charge very low rates, especially for goods.

"It is therefore natural that the traffic between Paris and London should have continually grown since 1927.

"In 1929 the Paris-London line, whose length represents 1.2 per cent of the system, carried 25 per cent of the kilometre-tons and earned 23 per cent of the commercial receipts obtained by the French undertakings. Exceptional though its output may be, however, its economic yield is smaller; for the aeroplanes on the Paris-London line, while accounting for 10 per cent of the total French mileage, also received 9 per cent of the subsidies.

"Here, therefore, we have a very active line with a large assured custom, but it does not succeed in recovering from its customers the cost of the service rendered."[1]

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[1] League of Nations, -op. cit.- P. 59

Skycraft gives later figures on the London-Paris lines:

"The London-Paris lines that come in at Le Bourget flyer field have carried over 121,000 passengers and 4000 tons of freight in the five years since regular service across the channel has been established. Le Bourget is not the only important French airport; an immense air terminal is being built at Pau into which air lines will taxi to allow passengers to embark and alight under cover. At Dijon the world's largest aviation beacon has been erected; its ray can be seen as far as 300 miles."[1]

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[1] Skycraft, Post, P. 246

German Air Services

Scheduled Air Line Operators:

"The chief of the aircraft companies in the Heavier-than-Air Department is the Deutsche Luft Hansa Aktiengesellschaft, which controls all transport services over German territory. It might really be said to be the only operating company; for such other concerns that exist are subservient ot it, also they look after air transport needs in their respective districts.

"Immediately under the control of the Luft Hansa comes the Air-Survey and Photographic Sub-Company trading under the title of Hansa Luftbild G.m.b.H. The regional operating companies number 23.

"In addition to these, and on a different footing there is the Deutsch Russische Luftver Kehrs-Gesellschaft (Deruluft), with headquarters at Lindenstrasse 35, Berlin, S.W. 68, and directed by Herren Fette and Steinhard. The control of this company is shared by the Deutsche Luft Hansa and the Government of Soviet Russia.

"Finally we come to the Luftschiffbau Zeppelin G.m.b.H., with headquarters at Friedrishshafen, directed by Herr Eckener. This company, our information leads us to suppose, is independent of the Luft Hansa, but as its activities are distinct this point is of minor importance."[1]

Development of regular German air traffic:

"Germany's chief aviation interests were concentrated in the vast network of airlines maintained by its principal air

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1. Jane's All the World Aircraft, 1934, P. 58a

transport company. Deutsche Luft Hansa, and two affiliated companies, Deutsche Verkehrsflug and 'Deruluft.' The lines of the Deutsche Luft Hansa linked 80 cities, 52 within Germany and 28 outside the country in the summer of 1921. In addition, 11 ports were served with special newspaper air service. The company received 14 million marks ($3,322,200 in 1931 from the Reich and 4 million marks ($949,200) from the German State and City governments.

"The Luft Hansa's daily maximum scheduled performance reached 41,277 kilometers in the summer of 1931 on lines with passengers, mail and freight; and 9,661 kilometers on special mail and freight lines. This could be compared with a total maximum of 54,000 kilometers daily in the summer of 1930.

"The trans-Alpine route from Munich to Milan, inaugurated in 1930, was extended to Rome in 1931 under a joint arrangement with a Italian company, Avio Lines Italiane. A second trans-Alpine line was opened in 1931 between Munich and Venice, and the line to Basle was continued as far as Berne. In the German domestic service, an 'Aero Bus' fashioned after the Ludington Lines was inaugurated between Cologne and Frankfort with seven trips daily each way, fares corresponding to second class rail rates, and a flying time of one hour as compared with four on the railroad. The venture was not as successful as its American counterpart, although Luft Hansa officials considered experimenting with the service again in 1932.

"Considerable attention was concentrated on increasing the efficiency of mail and express services during the year. Night air mail service which proved valuable from Berlin to

London and Paris was extended in 1931 to Hanover, Copenhagen, Oslo and Stockholm for the summer months. Foreign airlines cooperated with the Luft Hansa in the Scandinavian service. On the routes to Spain and Turkey, German railways and the Luft Hansa worked together so that night express trains carried the mail to Glerwitz or Stuttgart, where planes flew the cargoes to Istanbul or Barcelona.

"In 1931 the giant Junkers G-38, the largest land plane in the world, was placed in service between Berlin and London during the summer months. All aircraft of the Luft Hansa had been equipped with radio telegraph and proper navigation instruments by the close of 1931.

"The objectives of Luft Hansa outside Germany were being pushed systematically. For the North Atlantic, the catapult flying service of the steamers 'Bremen' and 'Europa' was developed further. Catapult flights were carried out over a distance of 1,200 kilometers with an intermediate landing in Nova Scotia. It brought the mail to New York from 24 to 36 hours ahead of regular delivery. On the South American route Luft Hansa worked with both steamers of the Hamburg South American Steamship Company and the 'Graf Zepplin.' German mail planes flew to the Canary Islands to be met with fast steamships which carried the mails to the island of Fernando Noronha off the coast of Brazil. Here planes of a sister company, the Condor Syndicate, met the steamships and flew the mails to South American points. A special feeder line to Friedrichshafen carried Berlin mail to the 'Graf Zeppelin,' which turned it over to the Condor Syndicate in South America.

Through these arrangements, it was possible to achieve a record of six days for the transport of mail, passengers, and express between Berlin and Buenos Aires.

"In addition to the transoceanic services being developed to North and South America, the Luft Hansa continued a service into the Far East. On May 31, 1931, the German-Chinese Air Transport Company 'Eurasia,' in which the Luft Hansa had an interest, opened service between Shanghai and Manchurian points, where the mail was sped by train to Irkutsk and carried by planes of the Central Air Navigation Company 'Woga' to Moscow. Luft Hansa planes placed the mail in Berlin from seven to eight days after it left Shanghai, a time saving of more than a week."[1]

The January, 1936 number of Aero Digest gives later material:

"Schkenditz airport which serves Leipzig and Halle reported more traffic in the 1935 summer season than in the same season of 1934. Passenger traffic increased 54 per cent, said to be greater than any similar increase in Germany. Outgoing mail from Leipzig increased 52 per cent; incoming mail increased 250 per cent. This is due to the movement of large quantities of raw furs delivered from Russia by air mail and after being dressed and dyed at Leipzig are again air mailed to their destination. Inks, medical instruments, spare machine parts, yeast and livestock are other items of importance carried. Air express traffic also increased. Sight-seeing passengers numbered 1500 in 1934 and 4500 in 1935; in addition, 12,200 children were taken on short flights at reduced rates."[2]

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[1] The Aircraft Year Book, 1932, p.p. 242-245

[2] Aero Digest, January, 1936, P. 100

The Netherlands K. L. M. Company

"In Europe, K. L. M. operated several lines during 1931: Amsterdam-Rotterdam-London; Amsterdam-London; Amsterdam-Rotterdam-Paris; Amsterdam-Hamburg-Copenhagen-Malmo; and Amsterdam-Bremen-Hamburg. Two services operated in 1930: Brussels-Paris and Lympne-Ostende were discontinued in 1931. For the first time, however, internal lines in the Netherlands were established; Amsterdam-Eelde and Rotterdam-Haamstede, eliminating the necessity of a tedious rail and boat journey.

"Traffic statistics of K. L. M. have grown steadily since 1920, when the line carried 345 passengers, 6,5,16 pounds of mail and 48,318 pounds of goods. During the first eight months of 1931 alone, the line carried 16,163 passengers, 203,148 pounds of mail, and 1,522,006 pounds of goods. The total daily mileage of the European service alone in the summer of 1931 was 4,745 miles and in the winter of 1931-32, 1,078 miles."[1]

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1. Aircraft Year Book for 1932, p.p. 257-258

British Air Power

The Air Annual of the British Empire 1934-5 gives an interesting account of commercial flying progress within the Empire. It is impossible to quote it in its entirety but the book may be found in the library of The College of Business Administration, Boston University.

Extracts from the article are as follows:

"Great Britain has fewer commercial aircraft than any other Great Power. She has no specialized services like the night mails of the Germans and Swedes; or the Transatlantic mails of the French and the Germans. Her commercial aircraft operates for the most part at lower cruising speed than those of other European nations. The extension of her routes have been taken piecemeal and with great deliberation, while the Dutch and the French have pushed forward with much enterprise and dash over some of the most hazardous stages. She has spent less per unit of load in subsidies than most other lands, and that assistance is falling off steadily. In brief, she has shown no taste in the spectacular and every desire to avoid risks.

"Nevertheless, her aviation has spread out like tenacles until she has the greatest route mileage of all the European Powers.-----

"A sceptical public appears to have been largely won over. A degree of comfort at least equal to that of the railways has been afforded to passengers. Steps are being taken towards flying throughout the twenty-four hours. And the sleeping car of the air is almost within sight. Finally, as

the reliability of engines is raised to a still higher level, and as air brakes and other devices allow high cruising speeds to be allied with low landing speeds, the big comfortable aeroplane may be able to boast higher performance as well as economy and safety. If that should come about in the next few years, it will be difficult for the critics still to say that Great Britain was wrong in advancing slowly, in putting safety and comfort first, and in learning to walk quite steadily before, in commercial aviation affairs, it started to run."[1] The following material from the Aircraft Year Book for 1935 will add to the picture:

"Great Britain is rapidly realizing her ambition, an objective determined upon in 1915, to be mistress of the air as well as mistress of the seas.

"Great Britain can transport aircraft on her large merchant fleet and establish an air force in any corner of the world. She has 50 merchant ships which she might convert into aircraft carriers in time of war. The dominions, colonies and possessions, with all their varied terrain, and meteorological conditions ranging from sub-Arctic to tropic climate, are available for experimentation training and commercial operations in the British program for aircraft development."[2]

"The British Imperial Airways is being extended from Singapore to Brisbane, Australia; so that these British routes aggregating 20,500 miles now criss-cross Europe, and at Cairo, Egypt, branch off in two directions, one in Capetown, South

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[1] Burge, C.G., Squadron-Leader, The Air Annual of the British Empire, p.p. 64-73

[2] The Aircraft Year Book for 1935, P. 33

Africa, and the other eastward through Arabia, India, Straits Settlements and thence to Australia. The objective is a seven-day service between London and Brisbane.

"Imperial Airways is developing plans for a transatlantic service by way of the Azores, with branches radiating to North, Central and South America. In cooperation with the four great railway systems in England, a very comprehensive system of fast mail, passenger and express services is being created throughout the British Isles, a program to which the Government is giving her utmost support. Great Britain has several reasons for expanding her air transport systems to the utmost.

"Repeated surveys have proven the theory that international trade flows fastest over the routes where deliveries are quickest; therefore Great Britain, having a position to maintain as the greatest carrier of ocean commerce intends to see that it is not lost to her in the air. Her program demands the earliest possible development of air transport routes linking industrial England with all her own colonies and also all the non-industrial nations of the earth, peoples which are in the market for goods manufactured abroad.

"By selling air transport service to other countries, Great Britain also can sell them air transport equipment and military aircraft whenever they need it. The British learned years ago that any people using British products in time of peace will turn to British products in war or preparedness for war. Accordingly, Great Britain has been a pioneer in cultivating foreign markets to provide extra sales outlets for her aircraft plants, the plants which her industry set up during

the World War and which the British people will never permit to pass out of existence. They learned their lesson when the Germans hopped over England's surface defence and repeatedly destroyed her docks, arsenals and other war production facilities, at the same time forcing large contingents of troops to remain at home to fight off the aerial invaders. The British insist that the air warfare of the last conflict was child's play compared to what it must be in any war of the future: and they are irrevocably committed to a program of aerial preparedness.

"Great Britain's policy since the World War has been to develop the greatest possible number of privately owned aircraft and aircraft engine plants. Shortly after the war the Air Ministry attempted to build planes in Government owned and operated plants, but these machines were not very successful; and the practice was discontinued. Since that time private manufacturers have been given every advantage. Only those manufacturers maintaining design staffs and other facilities for development are premitted to receive orders from the Government. There are 14 airplane manufacturers on the approved list; and it is significant that during the last 12 months those British manufacturers have produced 14 new types of planes for the Government air forces or the subsidized Imperial Airways.

"As is the case with all the other European governments, the British do not force their manufacturers into competitive bidding for aircraft orders. The Government negotiates contracts with the companies maintaining competent design staffs

and adequate manufacturing facilities. On the rare occasions when manufacturers are given contracts to manufacture from another's designs the origination of the design is reimbursed. This knowledge that they will be reimbursed for the outlay has inspired the British manufacturers to carry on expensive development work.

"To promote the sales of British aircraft products abroad the foreign sales are financed in London, with the active cooperation of the Government whenever necessary, and in accord with the policy of building up a manufacturing reservoir always available for British needs.

"In 1934 when the U. S. was taking the lead in discouraging American firms from disposing of aircraft products abroad, spokesmen for the British Government hastened to reassure nationals that they had nothing to fear; they would not be discouraged. Sir John Simons, Foreign Secretary said: 'Our diplomatic help is given when a foreign state has announced its intention to purchase abroad. In that case we do our best to see that British firms get a proper opportunity.'

"When a United States Senate munitions investigating committee held hearings in Washington in the fall of 1934, statements in the press made it appear that the Committee was about to divulge facts which would cast aspersions on certain South American governments and further, led the world to believe that the Senate Committee might soon bring about an embargo on exports of all aircraft products. Fear that their honesty might be questioned if they purchased further supplies for the United States and moreover, that, having purchased an embargo

at some future time might prevent them procuring replacements and parts, led the South American customers to look elsewhere for equipment. As usual they were able to purchase it in England; and Sir John Simon explained: 'We are convinced that the practical way to deal with this matter is not by national legislation that seeks to abolish private manufactures, but by regulation and control which can be in accordance with an international treaty negotiated in Geneva and signed, and absolved by all signatory States.'

"All Britain is enthusiastic at the prospects for stratospheric development within the next two years; and experiments are under way seeking to produce machines capable of long flights six miles high. One experiment contemplates a stratospheric flight from London to India within a day.

"Creation of more flying clubs with machines supplied by the Government, transportation of all first class mail by air in the British Isles, except when better schedules could be maintained on the surface, and the development of long range ocean flying boats for a British transatlantic service were among other projects for 1935."[1]

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[1] Aircraft Year Book for 1935, p.p. 33-37

Italian Air Forces

Italy began her air transport program in 1926. In 1930 the total distance flown was eight times greater than in 1926, and the number of passengers carried was ten times larger than during the first year.

In 1931 Italy was able to assemble 890 planes in its annual maneuvers--a division much larger than that assembled by the United States earlier in the year. During 1931 its air force promoted a constant program for research and development undertaking several important missions, the most spectacular of which was the crossing of the South Atlantic by air. Italo Balbo, the Italian Air Minister, was at the head of the flight.[1]

"Service was inaugurated in 1931 in cooperation with the Deutsche Luft Hansa between Rome and Berlin on a thrice weekly schedule, connecting with the regular daily service of the Societa Anonima Avio Linee Italiane between Milan and Rome. Daily services also were maintained by this company between Milan and Munich and Milan and Turin.

"Fast mail service was inaugurated in May, 1931 from Trieste, Venice and Genoa in Italy, through Marseilles, France, to Barcelona, Cartagena, Gibraltar and Cadiz in Spain. The two huge flying boats of the Do-x type were to be used on this service to make possible passenger accommodation as well as mail and express service.

"This service was operated by the principal Italian air line, Societa Anonima Navigazione Aerea, which held contracts

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1. The Aircraft Year Book for 1932, P. 254

with the Italian government for a continuing program of subsidies through July 1, 1939. It received $1.35 per mile flown with bi-engined seaplanes and $2.36 per mile flown with four-engined planes. Its routes included: Rome-Genoa-Marseilles, 446 miles, twice a week; Rome-Genoa-Marseilles-Barcelona, 739 miles, twice a week; Syracuse-Rome-Genoa, 261 miles, Rome-Naples-Syracuse, 421 miles, daily except Sundays and holidays.

"The Societa Aera Mediterranea, with its base at Rome, extended its service from Rome-Naples-Brindisi to Istanbul, Turkey, by way of Athens in 1931, and inaugurated a special service from Athens to Rhodes. Other routes of the company were: Rome-Tunis, Cagliari-Tunis, and Rome-Palermo-Tunis.

"The Societa Italiana Servisi Aerei ('Sisa') with its base near Trieste, operated seaplane service on five routes: Trieste-Lussino-Zara-Ancona, Trieste, Fiume-Lussino-Zara, Trieste-Fiume-Brioni-Venice, Trieste-Venice-Pavia-Genoa, and Turin-Pavia.

"There was a definite movement in Italian air transport to consolidate the activities of the several lines and insure efficient operation of the main routes. Since 1926, when the air transport program was first undertaken, traffic on Italian air lines increased until in 1930 the total distance flown was eight times greater than in 1926 and the number of passengers carried was ten times larger than during the first year."[1]

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[1] The Aircraft Year Book for 1932, p.p. 253-255

The Italian Government spent about $100,000,000 on its air forces during 1935. Under Government patronage, Italian aircraft manufacturers were encouraged to market their products abroad. Sales to foreign nations were financed by Government credits. The Government financed foreign aircraft sales up to 70 per cent.

The following Associated Press dispatch from Rome on November 22, 1934 is of interest: "Italy is getting ready to drive the United States out of the Chinese airplane market, it was learned today. A consortium has been formed by the three largest Italian aircraft manufacturers, under Government jurisdiction and with Government support, to sell Italian planes to China at cost. The Government will appoint Lieut. Furio Drago to head the Italian aviation school. China, which hitherto has specialized in bombing instruction, now will branch out into all lines of aviation instruction in competition with the American school.

"The Italian government is making a survey as to possible expansion of air transportation service through Europe as far north as London. Observing that the British, French, German and Dutch air transport system have steadily built up mail, passenger and express traffic, at the same time reducing rates, the Italians believe that the public soon will create a very great demand for scheduled flying service; and they are looking into the possibilities for extension of Italian lines in 1935."[1]

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1. The Aircraft Year Book for 1935, P. 43

Union of Soviet Socialist Republics

"Soviet air lines totaled 41,000 kilometers (25,800 miles) in October, 1931, about 18 times the distance in 1923 when services were first established. By the end of 1930, services had grown to 29,281 kilometers. During that year, 5,888,754 kilometers were flown with 17,834 passengers, 206 tons of freight and 144 tons of mail. Mail poundage increased sharply during 1931 to 258 tons for the first ten months.

"The main passenger air lines in 1931 were: Moscow-Irkutsk, 4,700 kilometers; Moscow-Baku, 3,025 kilometers; Moscow-Tashkent, 3,000 kilometers; Archangel-Syvtyvkar, 1,000 kilometers; Irkutsk-Yakutsk, 2,706 kilometers; and Khabarovsk-Sakhalin, 1,180 kilometers. There were numerous branch lines, many of which connected new industrial enterprises with Moscow and Leningrad. During 1930, up to 40 mail and passenger services were in operation. Important new routes added late in 1931 included; Moscow-Leningrad, Leningrad-Kiev, and Leningrad-Murmansk, which crossed the Barents Sea to Franz Josef Land. In 1932, another 40 air routes were to be added, bringing the total mileage of routes up to 70,000 kilometers (43,750 miles).

"International air transport was provided by the German-Russian Air Transport Company, 'Deruluft,' which operated three routes: Moscow-Koenigsberg, Leningrad-Koenigsberg; and Koenigsberg-Berlin. A marine airport was under construction at Leningrad, designed to be the largest in Europe. It was to constitute part of a new 'aviation city' with two aviation schools, meteorological and radio stations and other aero-

nautical activities centered there."[1]

"Expenditures for air line development in the U.S.S.R. during 1931 were reported at $70,000,000. Because of the similarity in geographic and climatic conditions in the United States and the U.S.S.R., Soviet authorities watched air line development closely, sending a commission of the Soviet Civil Aviation Trust to the United States in December, 1931, to study American lines with a possible view to purchasing equipment and engaging American technical assistance. The vastness of the U.S.S.R. made the problem of developing rapid communication more pressing than in other countries and considerable emphasis was being placed on the extension of lines to outlying places.

"The two air transportation companies operating within the boundaries of the U.S.S.R., the Dobrolet and Ukrvoskukhput, were merged into the Soviet Civil Aviation Trust. During 1930, only one line was operated throughout the year, but in 1931 practically all important routes were being operated 12 months of the year."[2]

Aeronautical development in Russia continued and in The Aircraft Year Book for 1935, the following report was given:

"Nowhere in the world has aviation developed so rapidly and with such intensity of effort as that which has grown up in Soviet Russia during recent years. The Soviet Air Transport lines operating over 31,000 miles of routes in Russia are carrying full loads of passengers and express.

"At the beginning of 1935, 36,000 students were enrolled in the schools of aviation industry."[3]

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1. The Aircraft Year Book for 1932, p.p. 266-267
2. The Aircraft Year Book for 1932, P. 266
3. The Aircraft Year Book for 1935, P. 44

Asia

Persian Services

In 1930 the Junkers Luftverkehr lines in Persia had established their financial independence. They had worked without a subsidy for three years and had transformed conditions of traffic.[1]

"Air traffic in Persia showed a decided increase in 1930 and 1931 although the German operating company which held a monopoly on civil aviation opened no new routes. The Junkers Luftverkehr, as the company was known, flew 701,426 kilometers in 1930 with 4,826 passengers, 27,847 kilograms of mail and 85,943 kilograms of freight. Its line linked Teheran with Baghdad in a six hour flight, compared with three and a half days by train and motor.

"Imperial Airways, Ltd., was permitted to cross southern Persia from Baghdad to Karachi, but could not carry local passengers."[2]

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1. League of Nations, -op. cit.- P. 45
2. The Aircraft Year Book for 1932, P. 260

The Japanese Program

The Japanese government, in its characteristic way, convinced itself of the importance of aviation and then proceeded to carry out its ambitious program. In 1931 it opened an aeronautical institute which cost nearly $2,000,000 and which was designed to be one of the best research establishments in the world.[1]

"The Japan Air Transport Company (Nippon-Koku-Yuso-Kaisha), due to receive subsidies totaling $10,000,000 from the Japanese government over a period of eleven years, reported a net profit of $200,000 in 1930 and paid a five per cent dividend. It had a 28 per cent increase in passenger traffic during 1930, and was growing steadily throughout 1931. Equipped with Fokker (Wright Whirlwind) transports of American and Dutch manufacture, and with some Japanese planes, the company continued its daily passenger, mail and express service from Tokyo to Darien in Manchuria, and inaugurated service from Osaka to Fukuoka with plans to extend the line to Shanghai. Other routes operated in 1931 were: Osaka-Matsuyama, Tokyo-Niigata, and Tokyo-Shimitzu."[2]

The Japanese Government continued to give its cooperation and also its financial support to the industry and at the beginning of 1935 it had begun "an aviation development program calculated to strengthen the nation's possessions on international trade routes in the Pacific and at the same time build up the army and navy air forces to a certain degree of protection from Russia's Red Air Fleet in case of war.

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[1] The Aircraft Year Book for 1932, P. 256
[2] Ibid

"The Japanese commercial program includes eight separate projects. The Government is helping to start an air mail, express and passenger air line service from Taihoku, Formosa, to Singapore by way of the Philippine Islands. Another commercial service, if present plans materialize, will be operated between Sappora and Saghalien, and another between Sappora and Kamchatka. The Government also planned to set up a commercial service between Tokio and the Bonin Islands."[1]

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[1] The Aircraft Year Book for 1935, p.p. 46-48

Aviation in China

The China National Aviation Corporation, a Chinese affiliate of the Curtiss Export Corporation, was organized in 1929. The Chinese company organized a service up the Yangtse River employing American aircraft and American pilots. An air service was inaugurated between Shanghai and Hankow and in July 1930, new operating contracts and important franchises were acquired from the government.[1]

"The Pan-American Airways Corporation has now acquired 45 per cent of the capital stock of the China National Aviation Corporation, the remaining stock being owned by the Chinese government. The commercial and administrative departments of the company are to be directed by the Chinese, while the flying operations will be managed by Pan-American, who will draw on their vast experience over 26,000 miles of airways between North and South America.

"The cooperation of Pan-American and the Chinese government has tremendous significance both for American aviation and American foreign trade. The Pan-American Alaskan airways constitute a possible link in an American-Asiatic system taking in Tokyo and both north and south China. The Japanese lines would supply the link between Tokyo and Shanghai or Peiping, and a Canadian system would, at St. Paul, make connection with airways in the United States."[2]

The Chinese Ministry of Communications and the Deutsche Luft Hansa organized the Eurasian Aviation Corporation. "Mail

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1. The Scientific American, July, 1933, P. 30
2. Ibid

was flown to Manchuli, trained from there to Irkutsk, where Soviet planes carried it to Moscow for transfer to Berlin-bound ships of the Deutsche Luft Hansa.

"The Japanese Air Transport Company continued daily service from Tokyo to Darien in Manchuria, with stops at Heijo, Keijo, Urusan, Fukuoka and Osaka on the 1,310 mile airway.

"The Canton Aviation Bureau in South China inaugurated air mail and passenger services with government-owned American planes, manned by members of the Canton Air Force, between Canton and Wuchow in Kwangsi Province.

"China imported 51 planes valued at $1,210,000 from the United States during 1930, and placed substantial orders during 1931."[1]

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1. The Aircraft Year Book for 1932, p.p. 228-231

Africa

"At the beginning of 1930, the only regular aeroplane services in Africa--apart from the Mediterranean basin, which is better classed with Europe--were the following:

"(1) The coastal section Casablanca-Dakar, connecting French West Africa with Morocco, but owing its true significance to its extension to South America;

"(2) The Belgian Congo system, a large and methodical enterprise whose efficient operation has already shown its effects on the life of the colony;

"(3) The first postal line of the 'Union Airways', organized on a modest scale in the Union of South Africa, which have been in existence barely a year.

"In addition, the first section, Cairo-Bagdad, of the British line to India, may be regarded as of importance to Africa.------

"The plans in process of realization chiefly aim at the establishment of Empire air routes, which do not afford any guide to the frequency or economic importance of the services which may be initiated in future.

"The Cape-to-Cairo route, which throughout traverses territory under British sovereignty or influence, will be entirely open to commercial aviation as from the beginning of 1931; its political unity will simplify the establishment of the air services.

"The route from Algiers to Madagassar lies, for over two-fifths of its length, over territory not under French sovereignty or influence--Belgian Congo, Rhodesia and Portuguese

East Africa. On this route there will, therefore, be a preliminary problem of international agreement and cooperation to be solved.

"The same will apply to the less important route, reconnoitred by the British military air service in 1929, which leaves the Cape-to-Cairo route at Khartoun and connects this great artery with Nigeria and the British West African colonies."[1]

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[1] League of Nations, -op. cit.- P. 18

Australia

Aviation is rendering valuable service to Australia. There are many gaps in the railway system. Moreover, the railways of the west consist chiefly of lines of penetration perpendicular to the coast, and the aeroplane has made it possible to establish rapid connection between planes where railway construction is always difficult and sometimes not an economic proposition.

"Subsidized air lines in Australia continued extensive service throughout the Commonwealth during 1931, while the principal unsubsidized line--Australian National Airways, Ltd. discontinued its services when the government refused to grant an application for subsidy in June. Approximately 1,700 miles of new regular subsidized air lines were added in Australia; while some 850 miles were discontinued, making a net gain of 850 miles for the national network. More than 250 planes were used in the subsidized and unsubsidized service combined.

"Western Australian Airways, Ltd. continued its weekly services between Perth and Derby, 1476 miles; Derby and Wyndham, 600 miles; and Perth and Adelaide, 1453 miles. Queensland and Northern Territories Aerial Services Ltd., provided weekly services between Brisbane and Camooweal, and Brisbane and Normanton, totaling 1,484 miles of airway. Both of these lines received heavy operating subsidies from the government.

"Australian National Airways, Ltd. discontinued service in June between Brisbane and Sydney, and Brisbane and Melbourne, totaling 980 miles of airways, when the government refused to grant a subsidy to the company to continue its

daily service. Guinea Airways, Ltd., reported a profit on its 80 mile operation on daily schedule from Port of Salamaua to the Ede Creek gold fields, although it received no subsidy. Aircraft Proprietary, Ltd., continued its unsubsidized service from Brisbane to Toowoomba, 75 miles, on a five times a week schedule.

"Australia had more than 109 airports and 150 emergency landing fields throughout the country in 1931. Of the larger airports, 21 were in Western Australia, 22 in New South Wales, 24 in Queensland, 5 in Northern Australia, 11 in Victoria, and 15 in South Australia. Considerable work remained to be done to plane these fields in shape to qualify as first-class airports under the American conception of such ports."[1]

The following report was given in January, 1936:

"'Airlines of Australia' has been registered with a capital of $1,000,000. Among the directors is Lord Senphill, and G. A. Robinson of New England Airways.

"The New England service to Townsville has been extended to Cann's, an additional mileage of 200, making it possible to fly direct from Sydney to Cairns.

"Air mail and express service from Fukouka southward to Taihoku, Taiwan (Formosa) was inaugurated with Fokker F73M planes. Four American transports are expected to be purchased when passenger service is inaugurated April 1. The 1000 mile route follows a chain of islands. A stop is made in the present weekly service at Naha, 435 miles north of Taihoku. The budget of the Taiwan Government General for the fiscal

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1. The Aircraft Year Book for 1932, p.p. 223-224

year ending March 31, 1936 provides $51,732 as a subsidy for an air service between Taiwan and Japan."[1]

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[1] Aero Digest, January, 1936, P. 98

Throughout the World

"In 1929, the aeroplanes in service on the regular transport lines covered approximately:

	Millions of Kilometres
Under the United States flag	33
" " French "	9.4
" " German "	9.6
" " British "	2.2
" " Italian "	6.7
" " Netherlands "	2
" " Soviet "	3.5

"The total work out at some 66 million Kilometres, or 1,650 times the circumference of the earth for the aeroplanes and seaplanes of these seven Powers."[1]

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1. League of Nations, -op. cit.- P. 15

EUROPEAN AIR FLEETS[1]

Country	Total Civil Aircraft		Aircraft Employed in Regular Air Transport		Average Pay Load (lb.) per Machine		Route Mileage	
	1931	1933	1931	1933	1931	1933	1931	1933
France	1,434	1,654	269	134	1,380	1,770	23,182	21,450
Germany	1,030	1,072	177	172	1,849	1,826	18,120	25,196
Great Britain	924	1,055	32	23	4,858	4,942	7,764	13,709
Italy	659	393	77	77	1,836	1,939	9,483	9,506
Belgium	136	173	46	31	2,274	2,056	2,787	3,032
Poland	113	141	31	34	1,510	1,532	3,061	2,841
Czechoslovakia	111	130	32	27	1,651	1,900	2,041	2,458
Spain	109	96	9	10	2,081	2,076	562	571
Switzerland	82	82	16	15	1,729	1,645	2,965	2,838
Netherlands	64	67	35	42	2,499	2,540	12,350	11,360
Hungary	51	73	6	6	2,507	2,507	420	767
Austria	45	57	10	10	1,337	1,336	2,553	2,313
Sweden	24	26	8	5	1,409	2,094	1,040	1,156
Denmark	10	11	5	5	1,540	1,902	840	860
Total	4,792	5,030	753	591	2,033	2,148	86,168	98,057

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[1] The Air Annual of the British Empire, 1934-5, P. 100

CHAPTER VI

CHARACTERISTICS AND EFFICIENCY OF AIR TRANSPORT

Speed

The essential quality of the aeroplane is speed, and the major airline operators are competing for faster and faster services. Speed is the commodity aviation has to supply to the public, for its appetite has been whetted by spectacular cross-country and cross-water flights, and its desire in travelling by air, as well as by land, is to "save time."

Speed has become such a predominating consideration that the emphasis placed upon this point has tended to becloud the mind of the public to other pertinent issues involved. To give effective service, speed must be accompanied by frequency of schedules. It cannot be obtained satisfactorily through the sacrifice of other important features, such as strength, comfort, and loading characteristics. "In 1928 the average speed was about 100 miles an hour; in 1933 the average speed was 150 miles an hour."[1] "In 1934 the rate of speed of transport craft approached 200 miles an hour."[2]

In the fall of 1935 a strong international competition was in progress. Paris announced that the Air Ministry of France has posted prizes of 3,975,000 francs ($238,500) to French aviators who would set new records for France and who would regain for it first place. Italy offered a large sum of money to Italian aviators who would set new world marks.

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[1] Scientific American, September, 1933, P. 116
[2] U. S. Department of Commerce, -op. cit.- P. 4

The United States succeeded in winning first place without any such government prizes.

Major Alexander P. de Seversky set a new speed record by pushing his 701 horsepower low-wing monoplane at 230.03 m.p.h. over a three-kilometer course. He easily bettered by 39 m.p.h. the 191 m.p.h. record set last December by Lt. E. G. Stone of the U. S. Coast Guard.

This achievement was followed by Gen. F. M. Andrews, Chief of the GHQ Air Force Brig. who flew a Martin B-12 Bomber at an average of 165 m.p.h. over a 1,000 kilometer course, bettering the 157 m.p.h. record established by General Musick, Sergievsky and Lindbergh in the Sikorsky S-42 on August 1, 1934.

Then came Howard Hughes who set a speed record for land planes in his $150,000 ship at Santa Ana, California. His record was 352.46 m.p.h. bettering the record previously held by Raymond Delmotte of 314.319 m.p.h.

Record speed is the greatest speed ever attained by a flying machine. Mr. Hughes holds this record. Miss Lena Ingalls holds the women's transcontinental speed record. Her record was 13 hours, 20 minutes, and 5 seconds in a plane with a cruising speed of 220 m.p.h. and top speed of 225 m.p.h.[1]

The quoting of exceptional speeds has no technical value. The speed in question may be due to a strong wind which helped the machine in its flight. The same wind might lower the speed of a machine doing the same journey in the opposite direction.

Transport machines in service or regular lines have a

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1. The National Aeronautical Magazine, October, 1935, P. 7

speed in accordance with their technique, general dimensions, and the power of their engines.

Regularity

Aerial transport has not a regularity comparable with that of transport by rail. A train is not on time if it is more than one minute late. In aviation many companies formerly regarded the service as regular if the plane reached its destination on the day it was due. Aerial transport has always depended, more or less, upon atmospheric conditions. The United States today is covered with a network of airlines whose schedules compare favorably with train punctuality. In some countries aerial transport is discontinued during the winter season. Occasionally, atmospheric conditions might cause air irregularity of schedule, or the lessening of tourist travel might be a factor in determining constancy.

Punctuality can be achieved and is achieved at its place of departure.[1]

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[1] The Winston Encyclopedia, Cumulative Revision, 1933

Safety

Five years ago very few statistics of aeronautical safety were available. The public knew that scientists had not conquered nature in air travel. Inadequate landing areas, promiscuous and indiscriminate military and civil flying, and the carrying of passengers by unqualified airmen caused unnecessary loss of life. Reports of these accidents were so magnified that people in general were not able to compare, impartially and intelligently, the safety of air travel with that of land and sea travel.

Airship advocates now insist that airships can be operated with as high degree of safety as other craft. They claim that "disaster and setback accompany all pioneering efforts, and successful operation comes with a volume of experience. Other carriers have had infinitely greater experience--yet trains are still wrecked, steamships go down"[1] and Death travels constantly with the automobile. No one even thinks of giving up these other carriers because things go wrong with them. "Airship accidents are magnified in the public mind because of the few units there have been to work with.

"The airship men point with pride to the record of the seven-year old Graf Zeppelin with its transoceanic flights nearing the hundred mark, its present bi-weekly schedule from Central Europe to Brazil constituting in each case the equivalent of a non-stop trip with full passenger and cargo load as far approximately as from Berlin to Denver.

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[1] National Aeronautical Magazine, October, 1935, P. 22

"Throughout the history of experiment and invention the practice has been to try to find the cause of the early failures and go ahead, seeking to avoid recurrence. The reasons for the accidents to the Shenandoah and the Akron have been clearly pointed out. The case of the Macon has had less attention. The Durand Commission, appointed by the Secretary of the Navy to make a scientific study of the whole airship business, should throw valuable light on the subject."[1]

"Recently, the American review, Aviation, gave for commercial aeronautics in three countries a death rate per million passenger-miles which worked out as follows after conversion into passenger-kilometres:

"Great Britain .... 0.27 per million passenger kilometres
"Germany.............. 0.24 per million passenger kilometres
"United States .... 0.256 per million passenger kilometres

"These figures, which apparently refer to the period 1925-1929 are remarkably similar. It should be noted that from 1925 to 1928, British subsidized air transport did not have a single fatal accident; but, its traffic not being very large, two accidents with several victims in 1929 were sufficient to bring it back to the common level of relative insecurity. Similarly, certain small companies which have so far had no accident involving the death of a passenger do not on this account provide proof of absolute security; a single accident would perhaps put them at once at the rate of one killed per million passenger kilometres.

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[1] National Aeronautic Magazine, October, 1935, P. 23

"This fact brings out the most serious difficulty of aeronautical insurance: absence of large numbers on which probabilities can be calculated."[1]

Miles Flown per Accident in Scheduled Air-Transport Services for Each Six Months' Period of the Years 1928, 1929, 1930, 1931, 1932, 1933 in the United States.

"The fact that flying on the scheduled airlines had become a safer method of travel year by year is a matter of record. Statistics gathered semi-annually by the Department of Commerce show a marked decrease in the accident rate for scheduled air transportation.

"This accomplishment is due to a number of things, one being the close cooperation of the scheduled air-transport operators carrying passengers in interstate commerce with the Aeronautics Branch and its regulations promulgated in May, 1930 relative to a standardization of operations, equipment, maintenance, and personnel. Another factor contributing to safety is the close adherence by operators to the departments' regulations prohibiting the flying of scheduled interstate air-transport planes, carrying passengers for hire, below an altitude of 500 feet (Statistics on accidents in scheduled flying are set forth in the following pages.)."[2]

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1. League of Nations, -op. cit.-, P. 38
2. Civil Aeronautics in the U. S., p.p. 27, 28, 29, 30, 31, 32

TABLE A - MILES FLOWN PER ACCIDENT IN SCHEDULED AIR-TRANSPORT SERVICES FOR EACH 6 MONTHS' PERIOD OF THE YEARS 1928, 1930, 1931, 1933

	Jan.-June 1928	July-Dec. 1928	Jan.-June 1930	July-Dec.1930
Miles flown	4,484,612	6,188,838	16,902,728	20,042,475
Total number of accidents	35	51	44	47
Miles flown per accident	128,132	121,350	384,152	426,436
Total number of fatal accidents	5	7	6	3
Miles flown per fatal accident	896,922	884,120	2,817,121	6,680,825
Total number of pilot fatalities	4	5	5	3
Miles flown per pilot fatality	1,121,153	1,237,768	3,380,545	6,680,825
Total number of passenger fatalities	2	13	22	2
Passenger-miles flown	(1)	(1)	52,264,616	51,482,633
Passenger-miles flown per passenger fatality	(1)	(1)	2,375,664	25,741,316

	Jan.-June 1931	July-Dec. 1931	Jan.-June 1933	July-Dec.1933
Miles flown	20,190,925	27,195,062	25,862,120	28,780,425
Total number of accidents	61	65	48	53
Miles flown per accident	330,999	418,386	538,794	543,027
Total number of fatal accidents	5	9	5	4
Miles flown per fatal accident	4,038,185	3,021,674	5,172,425	7,159,106
Total number of pilot fatalities	5	6	4	4
Miles flown per pilot fatality	4,038,185	4,532,510	6,465,530	7,159,106
Total number of passenger fatalities	9	17	2	6
Passenger-miles flown	47,501,901	72,466,676	76,642,393	122,157,686
Passenger-miles flown per Passenger fatality	5,277,989	4,262,746	38,321,196	20,359,614

[1] Passenger-mile figure not available for this period.

TABLE B - ANALYSIS OF CAUSES OF ACCIDENTS IN SCHEDULED AIR TRANSPORT SERVICES.

1932

CAUSES	Jan.-June	July-Dec.	Total
Number of accidents involved	67	48	115
Personnel:			
Pilot:			
Error of judgment	3.73	5.85	4.60
Poor technique	3.88	1.06	2.72
Disobedience of orders	.37	0	.22
Carelessness or negligence	2.98	6.38	4.39
Total Pilot errors	10.96	13.29	11.93
Materiel:			
Power plant:			
Fuel system	6.71	6.39	6.58
Ignition system	1.49	0	.88
Engine structure	7.47	6.38	7.02
Propeller and accessories	2.99	6.38	4.39
Engine-control system	1.49	0	.88
Miscellaneous	.75	2.13	1.31
Undetermined	1.49	2.13	1.75
Total power-plant failures	22.39	23.41	22.81
Structural:			
Flight-control system	0	1.06	.44
Undercarriage	7.47	10.64	8.77
Wheels, tires, and brakes	5.82	4.26	5.17
Tail-skid assembly	0	3.19	1.31
Undetermined	0	4.26	1.75
Total structural failures	13.29	23.41	17.44
Miscellaneous:			
Weather	31.72	25.53	29.17
Darkness	2.24	0	1.31
Airport and terrain	13.43	6.38	10.53
Other	0	2.13	.88
Total Miscellaneous causes	47.39	34.04	41.89

TABLE C - ANALYSIS OF CAUSES OF ACCIDENTS IN SCHEDULED AIR TRANSPORT SERVICES, Continued

1933

CAUSES	Jan.-June	July-Dec.	Total
Number of accidents involved	48	53	101
Personnel:			
Pilot:			
Error of judgment	1.04	5.28	3.27
Poor technique	3.12	1.89	2.48
Disobedience of orders	0	.47	.25
Carelessness or negligence	7.29	13.21	10.40
Miscellaneous	2.08	0	.99
Total pilot errors	13.53	20.85	17.39
Materiel:			
Power plant:			
Fuel system	7.30	8.49	7.92
Cooling system	0	0	0
Ignition system	0	0	0
Lubrication system	0	0	0
Engine structure	2.08	7.55	4.95
Propeller and accessories	4.17	5.66	4.95
Engine-control system	2.08	0	.99
Miscellaneous and Undetermined	6.25	3.77	4.95
Total power plant failures	21,88	25.47	23.76
Structural:			
Flight control system	0	0	0
Movable surfaces	0	0	0
Stablizing surfaces	0	0	0
Wings, struts, and bracings	0	0	0
Undercarriage	4.17	10.94	7.72
Wheels, tires, and brakes	4.17	9.34	6.88
Pontoons or boats	0	0	0
Fuselage and engine mountings	0	0	0
Tail skid assembly	2.08	0	.99
Miscellaneous and Undetermined	0	0	0
Total structural failures	10.42	20.28	15.59
Miscellaneous:			
Weather	27.09	18.30	22.47
Darkness	0	0	0
Airport and terrain	14.59	7.55	10.89
Other	8.33	0	3.96
Total miscellaneous causes	50.01	25.85	37.32

TABLE D - MILEAGE FLOWN PER ACCIDENT AND FATALITY IN MISCELLANEOUS FLYING OPERATIONS

	Jan.-June 1928	July-Dec. 1928	Jan.-June 1930	July-Dec.1930
Miles flown	12,000,000	48,000,000	51,767,200	56,502,560
Total number of accidents	395	641	917	1,116
Miles flown per accident	30,380	74,883	56,453	50,630
Total number of fatal accidents	92	123	142	159
Miles flown per fatal accident	130,435	390,244	364,558	355,362
Total number of pilot fatalities	65	87	114	130
Miles flown per pilot fatality	184,615	551,724	454,008	434,635
Total number of passenger fatalities	90	120	109	104
Miles flown per passenger fatality	133,333	400,000	474,928	543,294
Total number of all fatalities[1]	155	207	249	258
Miles flown per fatality[1]	77,419	231,884	207,900	219,002

	Jan.-June 1931	July-Dec. 1931	Jan.-June 1933	July-Dec.1933
Miles flown	43,282,595	51,060,520	32,748,485	38,474,360
Total number of accidents	993	1,212	765	838
Miles flown per accident	43,588	42,129	42,808	45,912
Total number of fatal accidents	109	144	80	102
Miles flown per fatal accident	397,088	354,587	409,356	377,200
Total number of pilot fatalities	90	119	68	86
Miles flown per pilot fatality	480,918	429,080	481,595	447,376
Total number of passenger fatalities	61	95	52	77
Miles flown per passenger fatality	709,550	537,479	629,779	499,667
Total number of all fatalities	163	237	128	182
Miles flown per fatality[1]	263,537	215,445	246,848	211,398

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[1] Includes fatalities to pilots, copilots, students, passengers, aircraft crew, ground personnel and spectators.

TABLE E. - ANALYSIS OF CAUSES OF ACCIDENTS IN MISCELLANEOUS FLYING OPERATIONS FOR THE PERIOD - JULY-DECEMBER 1933

	Licensed aircraft and pilots[1]				Experimental and restricted licensed aircraft[2]				Total[3]
	Instructional & Experimental	Com'l.	Pleasure	Total	Experimental	Com'l	Pleasure	Total	
Number of accidents involved	198	156	343	697	3	6	8	17	838
CAUSES									
Personnel:									
Pilot:									
Error of judgment	17.12	9.13	9.37	8.73	0	25.00	12.50	14.71	9.18
Poor technique	58.31	15.38	29.61	32.21	0	16.67	37.50	23.53	33.09
Disobedience of orders	.21	2.44	1.68	1.43	0	0	6.25	2.94	1.40
Carelessness or negligence	19.58	10.26	8.22	8.04	0	0	6.25	2.94	7.25
Miscellaneous	.53	.96	0	.36	0	0	0	0	.42
Total pilot errors	96.75	38.17	48.88	50.77	0	41.67	62.50	44.12	51.34
Material:									
Power Plant:									
Fuel system	15.40	9.62	7.45	7.42	33.33	0	12.50	11.77	7.06
Cooling system	.66	.64	.80	.72	0	0	0	0	.71
Ignition system	2.53	1.28	1.59	1.75	0	0	0	0	1.75
Lubrication system	0	0	.45	.22	0	0	12.50	5.88	.30
Engine structure	1.36	1.28	1.75	1.51	0	0	0	0	1.86
Propeller and accessories	.53	.64	.88	.72	0	0	0	0	.60
Engine control system	10.00	0	0	.14	0	0	0	0	.24
Miscellaneous	0	0	.42	.21	33.33	0	0	5.88	.29
Undetermined	2.55	3.08	3.16	2.93	0	8.33	0	2.94	2.78
Total power plant failures	33.03	16.54	16.50	15.62	66.66	8.33	25.00	26.47	15.59

1. This involves accidents to aircraft and pilots regularly licensed.
2. This involves accidents to aircraft licensed only for restricted and special purposes.
3. This includes unlicensed and licensed aircraft flown by unlicensed pilots.

TABLE E. - ANALYSIS OF CAUSES OF ACCIDENTS IN MISCELLANEOUS FLYING OPERATIONS FOR THE PERIOD - JULY-DECEMBER 1933--Continued

CAUSES-Continued	Licensed aircraft and pilots				Experimental and restricted licensed aircraft				Total
Structural:									
Flight-control system	10.53	0	0.29	0.43	0	0	0	0	0.71
Movable surfaces	.53	0	0	.14	0	0	0	0	.12
Stabilizing surfaces	0	1.28	0	.29	0	0	0	0	.36
Wings,struts,and bracings	.53	2.56	.58	1.01	33.34	0	0	5.88	1.91
Undercarriage	7.39	7.69	7.26	7.29	0	16.67	0	5.88	6.36
Wheels,tires,and brakes	2.13	.64	2.85	2.12	0	0	0	0	2.00
Pontoons and boats	0	0	0	0	0	0	0	0	0
Fuselage, engine mountings	0	0	.29	.14	0	0	0	0	.24
Tail skid assembly	0	.64	0	.14	0	0	0	0	.12
Miscellaneous	0	0	.29	.14	0	0	0	0	.12
Undetermined	0	0	0	0	0	0	0	0	0
Total structural failures	21.11	12.81	11.56	11.70	33.34	16.67	0	11.76	11.94
Miscellaneous:									
Weather	24.92	10.10	8.37	7.99	0	0	12.50	5.89	7.46
Darkness	0	0	0	0	0	0	0	0	0
Airport or terrain	4.42	13.40	10.61	9.41	0	16.67	0	5.88	8.37
Other	10.53	4.65	1.75	2.19	0	0	0	0	1.94
Total miscellaneous causes	39.87	28.15	20.73	19.59	0	16.67	12.50	11.77	17.77
Undetermined and doubtful	0	.64	.29	.29	0	0	0	0	.95

Report on Civil Aircraft Accidents in Miscellaneous flying for the last six months of 1934:

"The miscellaneous aircraft operators flew 392,141 miles per fatal accident in the period July-December 1934. This represented an advance over the corresponding period of 1933, when the miles flown per fatal accident were 377,200.

"For every accident that occurred, including both fatal and nonfatal, the miscellaneous operators flew 45,406 miles in the last half of 1934. This was almost the same as the corresponding figure for the last half of 1933, when the miscellaneous operators flew 45,912 miles per accident.

"Miscellaneous aircraft operations include commercial (exclusive of scheduled air transportation), pleasure, instructional, and experimental flying.

"The total number of accidents in miscellaneous flying during the final six months of 1934 was 855, of which 99 resulted in fatalities. In all, 1,565 persons were involved in the accidents which occurred. Of these 1,132 suffered no injuries whatever, 189 suffered minor injuries, 79 were severely injured, and there were 165 fatalities.

"Miles flown per passenger fatality were 517,627; per pilot fatality, 485,275.

"Causes of the accidents were divided as follows: Personnel errors, 53.60 per cent; power plant failures, 17.73 per cent; airplant failures, 11.59 per cent; weather 4.80 per cent; darkness, 0.28 per cent; airport on terrain, 9.74 per cent; other causes, 2.14 per cent; undetermined and doubtful, 0.12 per cent.

"An analysis of the accident report in the light of records on violations of the Air Commerce Regulations revealed that 139 of the accidents occurred during flights which were in one way or another contrary to the regulations. There were 288 flights involving violations of the regulations, some of them representing two or more violations each. In other words almost half of the flights which involved violations of the regulations resulted in accidents to the airplanes. There were 89 persons killed, 19 severely injured during flights in which the pilots ignored the provisions of the air commerce regulations. The violations consisted of illegal acrobatics, low flying, failure to display position lights, flying of licensed aircraft by unlicensed pilots, flying of unlicensed aircraft by licensed pilots, and miscellaneous.

"Of the 80 pilot fatalities in miscellaneous flying during the last half of 1934, there were 30 resulting from acrobatic flights, including 23 acrobatic flights which were direct violations of the Air Commerce Regulations. Eight of the pilots who lost their lives while engaging in illegal acrobatics were unlicensed. Outstanding among these acrobatic violations were: Performing acrobatics at low altitudes, performing acrobatics without parachutes, and acrobatics performed by unlicensed pilots in licensed airplanes."[1]

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[1] U. S. Department of Commerce, -op. cit.- May 15, 1935, p.p. 248-249

Radio Development

The radio has done much to insure safety in aircraft. The development of radio facilities and apparatus during the past decade has reached such a high state of efficiency that its use in controlling aircraft flights and schedules compares favorably with the most modern and elaborate railroad "block signal" systems.

"The Air Navigation Division of the Bureau of Air Commerce, Department of Commerce, has constructed a network of airways, radio-communication stations, radio range beacons, and radio marker beacons throughout the country for the dissemination of weather information and guidance of aircraft over the Federal airways.

"For the purpose of keeping aircraft in flight acquainted with prevailing weather conditions in their flight area, radio-communication stations have been established approximately 200 miles apart over the airways of the nation. The hourly weather reports and special reports described heretofore come into the radio-communication stations by teletypewriter and are broadcast as soon as they become available. In addition, each station broadcasts a brief report of weather conditions at its own location 30 minutes after each hour.

"Before the adoption of the chain system of broadcasting, radio-communication stations along an airway broadcasted on individually assigned schedules at various times during the hour. This made it necessary for a pilot en route to refer to a schedule to find the time of broadcasting for a station to which he wished to listen. Now he knows that the route he

is flying is covered by one of the chains, and is prepared to listen for the weather broadcasts at a certain time each hour. Bulletins are available showing times of broadcast and frequencies of all stations."[1]

"Radio must serve in lieu of eyes for the airman flying over the airways when weather conditions are bad. His eyes show him where to fly when visibility is good, but when fog, rain, or snow suddenly blot out his vision, he then must turn to radio.

"On the Federal airways system, radio is one of the mainstays of the aids to air navigation. The radio range beacons, by means of their constantly transmitted directional signal, point out the airman's course for him. Information as to weather conditions comes to him regularly through airways radio stations. Other radio stations show him how to reach his airport. If he has a transmitter as well as a receiver, he can always talk with the ground.

"However this system of radio air-navigation aids is not perfect and the Bureau of Air Commerce is constantly experimenting and trying to make improvements."[2]

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1. The Federal Airways System, U.S. Department of Commerce, July 1, 1935, P. 16
2. The Federal Airways System, U.S. Department of Commerce, July 1, 1935, P. 21

CHAPTER VII

FUNDAMENTAL REQUIREMENTS OF COMMERCIAL PLANES

One difference between the military and the commercial airplane is in the life expectation of the plane. Airplanes intended for industry must be more enduring as they will be used much more. In July, 1931 the "Graf Zepplin" made her 202nd flight and so has become a veteran world traveller. The U.S.S. Akron has carried 207 persons on a ten hour flight.[1] Wood, wire, and fabric construction that is adequate for military airplanes must be succeeded by all-metal or composite wood and metal structures for commercial use. A commercial plane must be kept light and have a higher strength factor to reduce maintenance costs.

Mr. W. B. Stout, M.S.A.E., who is responsible for the design of the Ford-Stout three-engine all-metal monoplane, gives the following requirements for practical commercial airplanes:

"(1) Absolute reliability of structure under all conditions of weather or fire hazard.

"(2) Absolute dependability of power plant, accomplished possibly by multiple engines.

"(3) A speed of 100 m.p.h. with full load, in horizontal flight at sea level, on not more than three-fifths of the maximum horsepower.

"(4) Pilot located forward to assure unobstructed vision when planes become common over air routes, particularly in bad weather.

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[1] The Aircraft Year Book for 1932, P. 130

"(5) A pay-load of at least four pounds per horsepower, with fuel for six hours of flight.

"(6) Ability to operate twenty hours per day in the air with load."[1]

There are two fundamental capabilities that a commercial airplane must have:

"(a) the ability to accomplish the most ton-miles per horsepower, and (b) the ability to stay in the air the most hours per day. The first includes all of the factors of design that make for performance and which, in most planes, have been paramount. The second embraces that part of design which relates to cost of maintenance, both in man-hours and in cost of material and overhead. The best commercial plane, therefore, is the one that will accomplish in the air the most ton-miles per dollar per day."[2]

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1. Pacé, -op. cit.- P. 692
2. Ibid

CHAPTER VIII

LICENSING OF AIRCRAFT ACCORDING TO NATIONAL LAW

Airworthiness

These requirements for airworthiness do not include regulations pertaining to lighter-than-air aircraft. General regulations cannot be formulated in this field, and each design of a lighter-than-air aircraft is handled in a different way.

"Aircraft are divided into three classifications as follows:

"(A) Normal airplanes, which are all heavier-than-air aircraft not included in definitions (B) and (C) below.

"(B) Light airplanes, which are heavier-than-air aircraft of less than 1,000 pounds gross weight with a wing loading of not more than six pounds per square foot.

"(C) Gliders, which are heavier-than-air aircraft having no power unit."[1]

In determining the airworthiness of aircraft the following factors are taken into consideration:

"(A) The structural strength of wings, control surfaces, fuselage, engine mount and/or nacelles, fittings, control system, and landing gear.

"(B) Cockpit, cabin and control arrangements.

"(C) Power plant and power plant installation.

"(D) Equipment and instruments.

"(E) Propellers

"(F) Detail design

"(G) Materials and workmanship

"(H) Flying characteristics and qualities

"(I) Safety features

"Certain of these items may be demonstrated by analyses and drawings, others by visual inspection, and others by tests."[1]

The requirements for airworthiness must be established before aircraft can be licensed for general commercial use. For technical data on the testing of aircraft for airworthiness see Airworthiness Requirements for Aircraft--U.S. Department of Commerce.

The conditions concerning airworthiness vary little in the different countries. Certain differences, however, may be justified. An aircraft must satisfy different conditions according to where it is to be used--a temperate zone, in the tropics, in the far north, in mountainous country, or on the plains. Thus it is possible that the same machine may be regarded in one country as not airworthy and may, in another country, be recognized as airworthy. This difference in regulations may have a harmful effect upon the national industry since it limits the possibility of mass manufacture in an industry which works with a view to export.[1]

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1. League of Nations, -op. cit.- P. 101

Registration of Aircraft

The conditions of airworthiness must be fulfilled before the aircraft can be admitted to air traffic. A certificate is granted then, and the machine must be marked and entered in the official register. In order to uphold safety in the air, a country must exercise permanent technical supervision over aircraft and must be able to identify the machine. Aircraft are marked with letters and numbers visible at a long distance and corresponding to entries in the official register. The register must contain the necessary particulars concerning the owner, operator, manufacturer, model, equipment, etc.

In the United States aircraft are approved for license by the Department of Commerce under two groups. The first group is composed of aircraft which the manufacturer intends to build in large quantities, and for which an approved type certificate has been issued. The second class consists of aircraft of which only a limited number are to be manufactured, and for which an approved type certificate is not desired.

"The procedure for obtaining the department's approval as to airworthiness for both groups is the same except that, in the case of the approved type certificate aircraft, the factory is carefully inspected to determine the ability of the manufacturer to build the aircraft in large quantities.

"Engines, too, which are to be used in licensed aircraft must be of a type approved by the engineering section.

Airplanes which have been partially damaged in accident are allowed to be repaired and relicensed, provided that evidence is submitted to the engineering section proving that the

repaired structure is at least as strong as it was before the accident and provided the inspection service approves the workmanship and materials which were incorporated in the repaired airplane."[1]

As a preliminary to registration, all countries require that the machine shall be the exclusive property either of a national or of a national company in the state of the country in which it is to be registered.

"As regards a company's nationality, the different laws contain different requirements. In the case of a company of persons, all the members, or at any rate those personally responsible, must be nationals of the registering state. For joint stock companies, on the other hand, the regulations differ. Denmark, Finland, Norway and Sweden have laid down requirements which go farther still. These countries require in principle that all the directors must be nationals domiciled in the country. Chile and Italy require two-thirds of the shares of joint-stock companies to be held by nationals of the country in order that the country may possess the nationality necessary for the registration of the aircraft. Similarly the United States of America requires that 51 per cent of the shares be held by nationals. According to the laws both of Germany and Danzig, therefore, it is possible for a company to acquire the nationality of the respective state even if all the directors and shareholders are foreign."[2]

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[1] U.S. Dept. of Commerce, Civil Aeronautics in the U. S., April 1, 1934, p.p. 43-44

[2] League of Nations, -op. cit.- p.p. 102-103

Insurance Responsibility

A few countries require proof of the deposit of security or of the conclusion of an insurance contract to cover any damages that may have to be paid as a result of an accident due to the exploitations of the aircraft. Other countries have passed laws on the subject of insurance, but they do not require compulsory insurance.

Aviation insurance may be obtained covering fire, theft, damage or public liability, or windstorms as with automobiles. "One leading company writes fire insurance in three different ways: Under all circumstances except fire resulting from crash; under all circumstances including fire from crash; and fire occurring only while the plane is on the ground.

"Insurance against wind storms only covers the plane while on the ground, whether in or out of the hanger." The "damage" policy usually covers only self-inflicted damage, as when a plane crashes, and does not cover damage caused by another plane or object. For property damage, another policy must be taken out which is similar to an automobile policy of this character and does not cover one's own plane. Public liability insurance protects the owner of a plane or fleet of planes against any legal liability to the public (not including passengers) for injuries or death due to an accident caused by his plane. The insurance company is liable, however, only for the limits of the policy. Another policy insures the lives of passengers carried, on which the premium is considerably lower, if they are not carried for profit.

"There are special policies which cover the legal liability of an airport for any accident occurring on or about it. These are written often for short periods, as when a race meet is to be held, or any other occasion when crowds are expected.

"Insurance covering flying risks may be issued at a flat rate or on a 'per flying hour' basis. In the latter, the premium is based on the number of hours flown during the life of the policy, and monthly reports are required to be made.

"Insurance companies cannot afford to assume anything, or take too long chances. Their computations must be based on facts and fully reliable statistics; consequently, the fact that they are insuring men engaged in aviation at a constantly diminishing premium and are placing no restrictions on air travel by their policy holders 'in a licensed airplane operated by a licensed pilot upon a regular passenger route between definitely established airports,' argues much for the increased safety of this form of travel."[1]

In Great Britain all forms of aeronautic insurance are handled by the British Aviation Insurance Group which cooperates with similar organizations in seven European countries. The British Corporation Register of Shipping and Aircraft inspects and classifies aircraft. It cooperates with similar societies in six other countries, and its work is of great value in the insuring of aircraft and also of their passengers and cargo. These British organizations are encouraged by the Government.[2]

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1. Mitchell, -op. cit.- p.p. 117-119
2. U.S. Dept. of Commerce, 1927, Civil Aeronautics in the United Kingdom, P. 22

A new air travel policy has been issued:

"Beginning January 1, 1936, six of the largest casualty insurance companies in the United States, Actna Casualty and Surety, Century Indemnity, Hartford Accident and Indemnity, Maryland Casualty and United States Fidelity and Guaranty Co., will underwrite a new form of insurance for airline commercial travelers, which will compare favorably in cost with other travel insurance. Termed 'airsurance' it will be an employer's voluntary contractual liability policy under which it will be possible for him to obtain up to $10,000 insurance for each employee named in the policy at a rate of $1.00 per $1,000 per year. The minimum premium for any one employee will be $50.00, covering five or more designated persons. This new policy was developed at the request of large corporations which have sought such a form of insurance for their executives and other employers to encourage them to take advantage of the time saved by air travel.

"This insurance is a contract of indemnity agreeing to reimburse an insured employer for a stated amount in case of death or injury to an executive or employee caused by accident on any recognized airline. It permits payment by the employer to any named employee in the event of injury. In the event of death, payment may be made to a relative or to any person named as the beneficiary.

"Officials of the United States Aviation Insurance Underwriters, Inc., and of Eastern Air Lines, Transcontinental and Western Air, United Airlines, American Airways, Pan American Airways, Pennsylvania Airlines, Northwest Airways, and National

Parks Airways, approved of the new airsurance."[1]

Insurance responsibility in Great Britain:

"In Great Britain, twelve leading insurance firms and two brokerage houses have formed a company to specialize in risks associated with aviation. It is known as Aviation and General Insurance Co., Ltd. and has a capital of $2,500,000."[2]

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[1] Aero Digest, January, 1936, P. 92

[2] Popular Aviation, January, 1936, P. 23

CHAPTER IX

LICENSING OF AIRMEN IN THE DIFFERENT COUNTRIES

The safety of air traffic is dependent both upon the airworthiness of the machine and also upon the competence of its crew. The airworthiness regulations require certain conditions which, when fulfilled, permits the machine to be registered and grants a special certificate. To insure a competent crew, departments have been created to examine the health and technical competence of airmen. Some countries entrust this examination to the air administration itself; others, to experts appointed by that administration; while a few have recourse to the services of recognized aviation associations.

Foreign Countries

Commercial Air Transport by Edwards and Tymms gives an account of the licensing of airmen in foreign countries:

"The general conditions for the issue of licenses to the operating crew of aircraft, and for the licensing of aircraft are laid down in the International Convention, and amplified in the case of Great Britain:

"Personnel:

Conditions are laid down in Annex E. of the International Convention for the issue of certificates to the following categories of personnel:

"For Flying Machines (Heavier than Air)

1. Private pilots flying certificate (the "A" license)
2. Pilot's flying certificate for public transport aircraft (the "B" license)

"For Lighter-than-Air Craft:

1. Balloon pilot's certificate
2. Airships' pilot's certificate (1st., 2d. and 3d. class)

"For all types of Aircraft:

Navigator's Certificate

"The detailed provisions whereby this is made effective in Great Britain are contained in the Air Navigation Directions. In addition Schedule II of the Air Navigation order empowers the Secretary of State for Air to issue licenses to competent persons for the inspection of aircraft as required by the International Convention."[1]

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[1] Edwards and Tymms, Commercial Air Transport, P. 96

The United States

Licensing of airmen in the United States:

"There are four classes of pilot licenses: Amateur, private, limited commercial, and transport. Experience and training requirements become progressively higher as the airman advances upward from the amateur to the transport grade, and his privileges become correspondingly wider. Amateur and private are noncommercial grades, limited commercial and transport are commercial licenses.

"The first step in the procedure of becoming a licensed pilot is taken not at the airport, but in the office of one of the Commerce Department's 700 medical examiners. These men, all physicians actively engaged in the practice of medicine in their own communities, have been designated by the Aeronautics Branch to examine candidates for pilot licenses.

"The prospective student pilot reports to a medical examiner for a thorough physical examination, and if he passes, receives from the doctor a student pilot license authorizing him to receive flight instruction. This student license also indicates whether or not the student is qualified physically for a commercial grade of license, and if he ever wishes to apply for a limited commercial or transport license he will have to produce this student pilot license (or other adequate evidence) to show that he has been found physically fit for the higher grades.

"A fee is charged by the medical examiner for this examination, and for less searching examinations for the physician's professional services, and are the only charges made in connection with licenses."

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1. U.S. Dept. of Commerce, Apr. 1, 1934 Civil Aeronautics, P. 40

When the prospective airman receives his student license, he is ready to fly, first in company with his instructor, and then in solo flights.

At the end of twenty-five hours of solo flying, during which time he has been studying the Air Commerce Regulations and Air Traffic Rules, he is eligible to apply for an amateur license. The Aeronautics Branch inspector gives him a written examination on the regulations, and has him demonstrate his flying ability by making take-offs, landings, and by performing various maneuvers.

The prospective airman then completes fifty hours of solo work and proceeds with the tests for the private license. These tests are similar to those given for the amateur license, but a higher degree of proficiency must be demonstrated throughout the test.

At fifty hours if the original medical examination qualifies him for the commercial grade, the candidate may elect to apply for a limited commercial license instead of a private license. The flight test and the written examination are much more comprehensive than those for the private grade. In addition to the subjects of the noncommercial grades, the written test covers elementary engine and plane mechanics and rigging. Higher standards are required with respect to the execution of flight tests.

After completing two hundred hours of solo flying the candidate is ready to apply for the transport grade, provided he is physically qualified. The requirements for this grade include a thorough knowledge of the Air Commerce Regulations,

elementary engine, plane mechanics, plane rigging, and a knowledge of the fundamentals of meteorology and air navigation. In addition to the tests of ability given for the lower grades, the flight test includes cross-country flying, and the inspector judges the entire performance by standards even higher than those for the limited commercial grade. Licensed transport pilots are eligible to become airline pilots, but if they transport passengers on interstate airlines they have to qualify for scheduled air transport ratings in addition to their licenses. They are authorized to fly for hire in cross-country flights, a privilege which is extended to no other grade.

If an airman has no desire to fly professionally, he frequently remains in the noncommercial grades, as renewal requirements as well as original requisites are less exacting. Commercial pilots must renew their licenses each six months and take a renewal physical examination each time. Noncommercial licenses are renewed annually with physical examination every two years. The renewal can be obtained by mail.

Licenses may be suspended or revoked, or civil penalties may be assessed up to $500. The licensed airman is responsible for observance of the regulations and will have to answer to an inspector if he disregards them.

In the event of an accident, the airman is required to make a report to the Aeronautics Branch.[1]

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1. U.S. Dept. of Commerce, April 1, 1934, Civil Aeronautics in the U. S., p.p. 40-41

Mechanics and Parachute Riggers:

An airplane mechanic is a man who adjusts or repairs aircraft, either during flights or in the repair shop at the airport. He starts as an apprentice, assisting experienced men in building, maintaining, or repairing aircraft. He receives his license after a year of such work and after passing an examination and practical tests to the satisfaction of an Aeronautics Branch inspector.

An engine mechanic's license will not be granted until the candidate has completed two years' experience. This experience may include one year on aircraft engines and one year on other types of internal-combustion engines.

Parachute riggers must take theoretical and practical tests pertaining to their trade, and riggers are responsible for the airworthiness of parachute under their care. Parachutes are inspected at regular intervals to make certain that they will be in condition for use at any time, and riggers must have a theoretical and a practical knowledge of their construction.[1]

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1. U.S. Dept. of Commerce, April 1, 1934, Civil Aeronautics, P. 42

CHAPTER X

SOVEREIGNTY IN THE AIR

Aviation has grown from a novelty into a vast industry involving a constant occupation and use of the air spaces over the entire world. The many questions which have been presented concerning the application of international law to aviation have necessitated the formation of an international code of law applicable to the use of air spaces over our country.

The literal application of the maxim "Whose the soil is, his it is from the heavens to the depth of the earth" to the flight of aircraft over private property would lead to the disastrous result that every such flight, no matter at what altitude, would constitute a right to sue for trespass by the owner of the property against the aircraft owner and operator. This ancient maxim was, therefore, abandoned, at least in part, and in the case of Johnson vs. Curtiss Northwest Airplane Company, et al., in the District Court of the state of Minnesota the court said: "The air so far as it has any direct relation to the comfort and enjoyment of the land, is appurtenant to the land, and no less the subject of protection than the land itself, but when, as here, the air is to be considered at an altitude of two thousand feet or more, to contend that it is a part of the realty, as affecting the right of air navigation, is only a legal fiction, devoid of substantial merit. Under the most technical application of the rule, air flights at such an altitude can amount to no more than instantaneous, constructive trespass. Modern progress and great public inter-

ests should not be blocked by unnecessary legal refinements."[1]

The general principle of the sovereignty of the air was considered "by the Aeronautical Commission of the Versailles Peace Conference, and the result was the drafting of the International Flying Convention dated October 13, 1919. Chapter I, Article I reads as follows: 'Article I. The High contracting parties recognize that every Power has complete and exclusive sovereignty over the air space above its territory.' The principle of the sovereignty of the state over the air spaces above its territory has, therefore, been universally recognized.

"In addition to establishing the basic principle of state sovereignty over its air spaces, the International Convention also provided for the freedom of innocent passage in time of peace over the territory of each contracting state to the aircraft of other contracting states, provided the conditions laid down in the Convention are observed. Such conditions include provisions for certificates of airworthiness and competency, rules to be observed on departure, when underway and on landing, prohibitions against the transport of explosives, arms and munitions of war, further prohibitions against the use of photographer apparatus except upon compliance with certain conditions, requiring display of identification marks, reservation of the right to inspect alien aircraft, and in general protecting what might be termed the obvious rights of the state granting the privilege of passage.

"The International Convention also contemplates that the separate states, in accordance with the principles of the

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[1] U. S. Aviation Reports, 1928, P. 44

Convention, will establish their own rules and regulations governing the use of air space over their territory. Practically all of the nations of the world have already established such rules and regulations. The United States took no action in this respect until the passage of the Air Commerce Act in 1926, which was followed by the Air Commerce Regulations of 1928 established under the provisions of the Act in question. Because of constitutional prohibitions, the Air Commerce Act only applies to aircraft engaged in interstate or foreign commerce. In the Act the Secretary of Commerce is given the power to promulgate regulations for the registration and rating of aircraft, the examination and rating of airmen, and air navigation facilities, the establishment of air traffic rules, the establishment of civil airways, preparation of charts and maps, the control of the passage of foreign aircraft. The regulations adopted by the Secretary of Commerce for the purpose of carrying out the provisions of the Act provide an elastic code of regulations which can be added to or changed by order of the secretary. The value of this condition is incalculable to an industry so new and undergoing such constant changes as the aviation industry."[1]

No solution has been found for the question whether and how far State sovereignty extends to aerial traffic over the high seas. There is a certain general agreement that the aircraft itself and its actions are subject to the law and jurisdiction of the State whose nationality it possesses. This rule is far from satisfactory for often the aircraft does not

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[1] Black, A., Transport Aviation, p.p. 32-34

possess the nationality either of the country from which it started or of the country in which it lands.

There are great disadvantages resulting from the absence up to the present of any general regulation governing traffic in space which is not subject to the sovereignty of any state.

In the long run, aviation cannot dispense with international police regulations such as apply to navigation on the high seas. International regulations involving the freedom of oversea air traffic should be adopted before it is too late.[1]

States grant each other a right of passage. The machine and the crew are subject to the domestic law of the state flown over, and thereby the inviolability of all private rights is ensured. The passage of aircraft over private property at such a height as not to interfere with the use of the property by the owner does not constitute a trespass. The operator of an aircraft making an unavoidable emergency landing on the property of others has been held to be guiltless of a trespass but responsible for actual damage to the property. The operator who deliberately lands on the property of others without establishing that the landing was the result of an unavoidable emergency would be a trespasser subject to prosecution.[2]

The sole principle involved in the licensing of aerodrones is that operating companies who undertake to carry passengers for hire or reward shall not do so from places which are unsafe for the purpose.

The International Convention calls upon each contracting state to notify the other states as to particulars of aero-

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1. League of Nations, -op. cit.- P. 113
2. Black, -op. cit.- P. 36

dromes at which aircraft engaged in international air traffic are compelled to land for customs or other purposes.

"The Convention further provides that every aerodrome in a contracting state, which, on payment of charges, is open to public use by its national aircraft, shall be open also to the aircraft of all the other contracting states. Similar provision is made in all agreements between this country and non-contracting states."[1]

"When the air traffic Conventions provide for the possibility of a State, for reasons of public safety, restricting the transport of specific articles, they assume that the same treatment shall apply both to national aircraft and to the aircraft of the other contracting state."[2]

The Most-favored nation clause:

"The most-favoured-nation clause may occur in commercial and establishment treaties, or in an air traffic convention. In either case the question is how far it affects international air traffic.

"Whether the most-favored-nation clause contained in treaties of commerce and establishment applies to air traffic depends upon the scope of the clause in the treaties in question. Today it is not usual to adopt an unrestricted most-favored clause governing all the international relations of the contracting states. On the other hand, we find some commercial and navigation treaties which contain a most-favored-nation clause applying to every kind of transport or transit."[3]

The most-favored-nation clause is of the greatest value

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1. Edwards and Tymms, -op. cit.- P. 100
2. League of Nations, -op. cit.- P. 117
3. Ibid

to commercial aviation when two contracting parties grant each other most-favored-nation treatment in the operation of their jointly established airlines.

CHAPTER XI

COST OF AIR TRANSPORT

Capital Charges

The cost of air transport includes numerous items. The costs may be divided into capital charges and operating charges. Numerous costs are included in the former classification. These costs may be enumerated as follows:

1. Organization expense.
2. Cost of furniture and equipment of field and executive offices.
3. Engineering surveys.
4. Real estate for main flying field.
5. Other property for terminals and emergency fields.
6. The improvement of the real estate and property purchased including grading, surface water drainage, roads and runways, water supply, sanitary sewerage disposal, etc.
7. Buildings to house the personnel and equipment as well as the "flying" stock. These buildings might include an office building, dwellings for permanent field personnel, shops for wood and metal working, hangars for airplane storage, garages for the auxiliary automobiles and trucks, warehouses for spare parts and supplies.
8. Light, heat, and power in all shop and office buildings.
9. Telephonic and telegraphic communications, both wireless and wired.

10. Meteorological instruments.
11. Fire prevention and extinguishing apparatus.
12. Equipment of airplanes, spare engines, flying and navigating instruments, aircraft radio sets, and complete equipment of engine and plane spare parts.
12. The ground equipment at terminals including wood and metal working machinery, engine test stands, benches, vises, special trestles, and cranes for handling engines, cranes for heavy airplane parts, tractors and rollers for field maintenance or for moving the large planes around, automobiles, motorcycles and side cars, trucks or delivery wagons.

Operating Charges

The operating charges are always a matter of concern to any executive. Under administration expense are included such items as rentals, executive salaries, clerical and sales department salaries, cost of lawyers, advertising, telephone and telegraph bills, taxes, etc.

The main items under operating charges are included under overhead expense. These costs may include expendable supplies such as gasoline, oil and grease, insurance charges, wages, depreciation, the maintenance of telephone and telegraph lines, repair of buildings and travelling expenses.[1]

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[1] Pacé, -op. cit.- p.p. 704-705

Why Various Estimates Conflict

Many conflicting estimates have been given of airplane operating costs when these costs have been applied to commercial uses. The reason for this conflict between authorities has been the factors affecting operating cost and investment. The following important factors might be considered:[1] (Order of listing carries no significance.)

1. Value of traffic
2. Intensity of use of equipment
3. Size of airplanes
4. Payload carried per horsepower
5. Water or land flying
6. Day or night operation
7. Airplane and engine maintenance costs
8. Cost and supplies in operating territory
9. Cost and efficiency of labor in territory
10. Cost of terminal facilities
11. Cost of getting business
12. Operating hazards
13. Efficiency of management and personnel
14. Operating experience on route
15. Rigidity of adherence to schedule (if any)
16. Extent of government aid of local cooperation

"Many of these factors are related to one another. For example, rigidity of schedules usually necessitates allowing liberal reserve equipment to ensure the maintenance of these schedules. This naturally reduces the intensity of use of

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[1] Black, -op. cit.-, P. 229

the equipment as measured in miles-per-airplane-per-year. Thus, it will cost more per airplane mile to operate on a rigid schedule than on one where some few hours of delay is permissable. Many of the elements listed are fixed by the operating conditions while others are to some extent under the control of the management. To illustrate the extent of variation in costs for different conditions, it might be mentioned that the various estimates prepared by the author and collaborators ranged from slightly over 40 cents to over $2.00 per airplane mile exclusive of capital charges--which also vary greatly. Even this does not present the complete range, because very large airplanes would run far above it in cost per mile. Although probably lower in unit cost per passenger or per pound. On the other hand, private owners flying inexpensive airplanes equipped with small engines and who have practically no overhead may find it possible to keep their costs well below even the 40-cents-per-mile-figures given."[1]

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1. Black, -op. cit.- p.p. 229-230

CHAPTER XII

SCHEDULED AIR TRANSPORTATION

Basis for the Development of Air Transport Operations

Air transport operations have developed into a well-organized system of commercial air lines over which aircraft fly at regular frequent intervals with mail goods and passengers. Since 1931 the United States has occupied a position of world leadership in the field of air transportation.

Mileage figures give an indication of the development that has taken place during the past few years, but they only tell a part of the story.

Studies undertaken by the Aeronautics Branch of the Department of Commerce of the United States show a substantial gain in the volume of business flowing over the airlines, and the basis of this development is founded primarily upon the following facts:

"1. That air transport offers greater speed than any form of surface transportation

"2. That the freedom of air transport from limitation imposed upon surface transportation by topography enables it to offer material savings in time in addition to those made possible by the inherent speed of the airplane

"3. That the operators are paying special attention to the comfort and convenience of their service in order that their passengers may be free to enjoy to the utmost this scenic mode of travel with its free-

dom from dust and dirt

"4. That the safety and reliability of air transportation is demonstrated by the day-in and day-out operations of the air lines.

"5. That payment to air mail contractors now is on a space-mileage basis, and combined passenger and mail service is encouraged under the provisions of existing air mail legislation

"6. That careful attention is being given to the selection of logical routes and the provision of equipment adapted to the needs of the particular service involved

"7. That air lines are effecting exchanges of traffic with other carriers and are cooperating in the matter of schedules, permitting ready connections when transferring from one line to another or to or from surface transportation systems

"8. That operators are cooperating in attacking a perplexing problem which has arisen in the development of other forms of transportation, namely, that of educating the public to the advantages of the services offered and of developing a demand for these services

"9. That airlines are operating on more frequent and more convenient schedules and are keeping the fares as low as possible consistent with the services rendered."[1]

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[1] U. S. Department of Commerce, July 1, 1932, Scheduled Air Transportation, P. 2

Air Mails

The first pilot appointed by the United States Post Office Department to carry mail was Earle L. Ovington. His appointment was for a period of one week, from September 23-30, 1911, during which time he carried cards and letters from Nassau Boulevard on Long Island to the post office at Mineola near by, dropping the pouches over the side for the postmaster to pick up.

A congressional appropriation for experimentation with air mail was recommended by the Post Office Department in 1912.

A step was taken in the establishment of an air mail system when Congress appropriated $100,000 for the fiscal year ending June 30, 1918, the money to be used in establishing an experimental air mail route. The Post Office Department arranged for the first scheduled air mail line extending from Washington to New York. The first flight, on May 15, 1918, was made by an Army pilot in an Army plane.

On August 12, 1918, the Post Office provided its own pilots and equipment and assumed entire responsibility. The line continued in operation until May 31, 1921, when this particular experiment was concluded.

The operation of an air mail route between New York and Washington convinced the officials of the department that air mail was practical, and then they made plans for extending the service. The next route considered was the one between New York and San Francisco.

"On May 15, 1919, the first mail was flown on that part

of the projected cross-country line between Cleveland and Chicago. On July 1, the operations were extended from Cleveland to New York, May 15, 1920, the anniversary of the Cleveland-Chicago line, saw the service extended westward to Omaha, and on September 8, the final link between Omaha and San Francisco was established. In the same years feeder lines were inaugurated between Chicago and St. Louis and between Chicago and St. Paul and Minneapolis.

"Feasibility of night air mail was demonstrated by a day and night relay of flights from coast to coast begun on February 22, 1921, the trip being completed in 33 hours and 21 minutes of elapsed time. Then the Post Office Department arranged for installation of radio facilities and airway lighting. Lights were installed first between Cheyenne, Wyoming, and Chicago. Planes were equipped with navigation and landing lights, and test flights were made during August 1923. Through transcontinental service, with day and night flying, began July 1, 1924.

"In the same year the department determined to adopt again a special postage rate for the air mail. The country was divided into three zones, with the charge for each zone being 8 cents an ounce. Thus, a letter sent from New York to San Francisco required 24 cents postage. This complicated scale was dropped on February 1, 1927 and replaced by a flat rate of 10 cents per half ounce, reduced in August 1928 to 5 cents for the first ounce and 10 cents for each additional ounce. When postage rates in general were increased in July 1932, the air mail rate was made 8 cents for the first ounce

and 13 cents for each additional ounce."[1]

Previous to 1926 domestic air mail development was a project carried on entirely by the Post Office Department. "Some foreign air mail was carried under contract, the routes including that from Seattle to Victoria, established October 15, 1920; Key West to Havana, begun on the same date; and New Orleans to Pilottown, La. A contract route was operated between McGrath and Fairbanks, Alaska, from February 1, to June 30, 1924.

"But the post office had never expected to establish itself permanently in the business of carrying air mail, even within the borders of the United States. The Kelly Act, which became law on February 2, 1925, authorized the department to turn over transportation of air mail to private enterprise by contracting for its carriage at rates not to exceed $3 a pound.

"Awarding of contracts under the Kelly law began in 1926, and by the end of the year 14 domestic air mail routes were operating on this basis. The transcontinental service was still operated by the Post Office Department and included an overnight service between New York and Chicago, but this line was advertised for private operation.

"Further impetus to the development of the air mail was given by the Air Commerce Act of 1926. Under the provisions of this act the Aeronautics Branch of the Department of Commerce was created and the Department of Commerce undertook the establishment and maintenance of the country's airways. The progress that has been made by the Aeronautics Branch in

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1. U.S.Department of Commerce, April 1, 1934, Civil Aeronautics in the U. S., P. 11

developing the airways has been an important factor in the expansion of the air mail system under private operation and the increasing efficiency with which this work has been performed.

"At the beginning of 1930 New York was linked with Miami, Chicago with Atlanta and also with Dallas, Los Angeles with Seattle, and there were many other routes, nearly all of them, with the exception of the transcontinental, running north and south, or diagonally. More extensive transcontinental air mail service was provided during 1930 by contracts for two other cross-country-routes. One of these was established between New York and Los Angeles, by way of St. Louis, and the other from Atlanta to San Diego via Fort Worth, Texas.

"In addition, the Post Office Department was developing foreign air mail service. The Key West-Havana line, discontinued in 1923, was resumed in 1927 and became the first link of a great Latin American system. The terminal for the United States was moved to Miami, and in subsequent years mail service was inaugurated to Central America and South America. Air mail routes to Mexico from Florida and from Texas were established. American mail routes touched at Vancouver, Toronto, and Montreal, and service to Winnepeg was begun early in 1930." [1]

The air mail traffic in the United States became so tremendous that special airplanes were designed for this service. In foreign countries, where the volume of mail is much less, the mail is carried in the baggage compartments of passenger airplanes. The special air mail planes are not suited for carrying freight or packages. This is due mainly to the limited

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1. U.S.Department of Commerce, April 1, 1934, Civil Aeronautics in the U. S., p.p. 11-13

cubic capacity of the mail airplane, which is designed primarily for high speed and a heavy cargo packed into small space.

In the airplanes designed for mail only, the cargo compartment is placed in front of the pilot, as nearly as possible at the center of gravity and is of such cubic capacity as to carry its entire rated load on the basis of not over fifteen pounds per cubic foot. The mail compartment is metal lined to retard spread of fire in case of a crash, is arranged to load from the top and has an easily removable but securely fastened cover. No electric wires or controls can be carried through the mail space unless well protected against injury. In many cases these wires and fixtures are placed below the floors or outside the body. Special devices have been designed for dropping and picking up mail in flight.[1]

On January 1, 1934, there were 44,665 miles of mail airways in the United States. The daily average of flying miles scheduled for United States contract mail was 119,017, and the mail was carried on 67 domestic routes and 16 routes to Canada, Central and South America. The Government sustained a loss of $3,500,000 in flying the mail. The casualties were 9 pilots and 3 passengers.[2]

"On February 9, 1934, the Post Office Department cancelled all contracts of operators flying mail on routes within the United States the order to become effective on February 19. The reason given by the Department was that the contracts had been obtained through "collusion" during the previous Adminis-

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1. Black, -op. cit.-, p.p. 189-193
2. The Aircraft Year Book for 1935, P. 397

tration. Hundreds of thousands of words were written and printed in the form of statements and speeches during the bitter controversy which followed------The Post Office Department maintained its original position that the contractors had met in "collusion" in the office of the former Postmaster General. The operators denied "collusion" and asked for trial on hearings.

"Cancellation of the air mail contracts held by the established pioneer companies operating inside the United States was accompanied by an executive order from the White House that the Army Air Corps should fly the mail. Air Corps operations started on February 19, and terminated on June 1, 1934. There was a hiatus when army mail flights were suspended between March 10 and 19 to afford time for a reorganization of this emergency service as a result of public criticism developing out of a number of fatal accidents to Air Corps personnel. Officials blamed exceptionally bad weather conditions. A majority of the critics asserted that the pilots were not accustomed to scheduled cross-country flight operations day and night, and their equipment being military in character, was not fitted for cargo transport. It was agreed, however, that the Air Corps made an exceptionally fine showing under the circumstances.

"On the last transcontinental mail trip by the Air Corps on May 8, 1934, six pilots flying Cyclone powered Martin bombers and Curtiss attack planes in relays, sped eastward from Oakland, California, and the sixth-plane landed the mail at Newark in 14 hours and 8 minutes from the time it left the Pacific Coast.---

"During these operations the Army Air Corps carried 768,215 pounds of mail, spent 14,745 hours in the air, and flew an aggregate of 1,707,559 miles. In addition the hours of actual flying with mail, more than double that many, or 32,641 hours, were flown on such missions as mail administration, mail emergency and mail training.------

"On January 26, 1935, the New York Herald Tribune carried a dispatch signed by Theodore C. Wailen, head of its Washington Bureau.

"Jan. 25- The cost of the disastrous experiment in the use of the Army Air Corps to carry the mails last winter and spring, it was officially reported today, has been finally recorded as $3,767,355.22, in addition to the loss of 12 lives in 66 accidents--the average cost a mile of flying the mail under Army airplanes was $2.21. The latter figure compares with the $0.54 a mile average paid the former air mail operators during the fiscal year 1933.

"Two Administrative measures followed cancellation of the contracts. An air mail law (S.3170) was passed and approved June 12, 1934, providing for temporary mail contracts, to be awarded under competitive bidding, for the duration of one year, the rate fixing to be by the Interstate Commerce Commission. It also provided for the appointment of a Federal Aviation Commission to make a report to Congress recommending an aviation policy."[1]

The Air Annual of the British Empire gives an interesting account of the air mail services in Great Britain and in other

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[1] The Aircraft Year Book of 1935, p.p. 120-126

countries:

"The real test of the value of air transport is the use that is made of the mail services.-----The rate of increase in mail loads has been amazing, and it is a striking fact that over a period of years there has been a notable increase in continental air mails. The loads offering on the continental services, for example, increased themselves nearly four times in the period 1929-33, whereas the weight of mail on the India service in the same period was not quite doubled. That is a remarkable fact if it is remembered that the time saving on the continental routes is rarely as much as a day, and that carriage by air on the India route may represent a saving of anything up to a fortnight. Great Britain, concentrating on her Empire services, has not shared as she might in the continental loads. A bigger and bigger proportion of British mails for the continent is being carried by foreign aircraft, partly because of the small number of European cities served by Imperial Airways, and partly because of competition of foreign night-flying services.----

"In other words, the habit of using the air mail has been fostered very largely by reliability and regularity, and there are characteristics more readily attained on the long runs to South Africa and the East, where some elasticity of schedule is possible over a period of several days, than on the short runs in Europe, where the fog of one winter's day may cause the cancellation of three or more services.------

"The outward air mail from Great Britain at Christmas, 1933 was bigger than ever. The loads for the India route

amounted to 3,000 lbs. and those for the African route to 1,300 lbs. In the course of the year the air mail which left this country was no less than 85 tons."[1]

In 1933 the total of air mails in Australia rose from 14.6 tons to 17.63 tons. In Canada the mail loads increased from 184 to 240 tons.

Experimental air mail flights have been made between Europe and Australia by the British and by the Dutch. Australia has organized experimental air mail flights to England and return.[2]

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[1] The Air Annual of the British Empire, p.p. 66-69
[2] The Air Annual of the British Empire, p.p. 69, 82

Air Passenger Transportation

Transportation by air is much more comfortable and pleasant than by any other form of travel. When the speed is around 130 miles an hour, the motion due to rough air is not so perceptible as at ordinary speed on railway trains or on steamers. The planes can be made practically noiseless, with no vibration. There is an absence of dust, smoke or cinders, the seats are well-upholstered, and the sleeping berths can be made very comfortable.

A description of the New Douglas Sleeper Plane (DC-3) will give a picture of comfort which cannot be surpassed by any other form of conveyance. The cabin is 7 ft. 8 in. wide and 6 ft. 6 in high. The interior of the passenger cabin comprises eight sections, four on each side of a broad aisle. Each section includes two seats, each 36 in. wide, facing each other. At night the backs and bases of these seats fold together to form a thick, soft foundation for the mattress for the lower berth. The upper berth and mattress drop into position from the ceiling of the section.

"Each berth measures 6 ft. 5 in. in length; lower berths measure 36 in. in width, uppers 32 in. Bottoms of the lower berths are 6 in above the floor at night and 8 in. during the day, leaving spare for storing small hand luggage. The springs and mattress add another 9 in. to the height, holding the sleeping passenger 14 in. above the floor of the cabin. The upper berth is 46.5 in. above the floor and steps are provided to enable passengers to enter this berth with ease.

"Cabin windows serve the lower berth. A smaller window, at the head, serves passengers in the upper. Both berths are complete with reading lights, clothes nets, electric call buttons, and baggage racks.

"Separate dressing rooms are provided for men and women passengers. These are located at the rear of the cabin and are equipped with running water, mirrors, and linens.

"A complete commissary is located at the front of the cabin, directly behind the pilot's cockpit. Provisions will be included for keeping food hot or cold indefinitely without need of thermos equipment. The spaciousness of this compartment will enable the serving of more elaborate meals than are now possible.

"Spare for baggage and mail is at the extreme aft section of the fuselage and at the forward end of the cabin, directly opposite the commissary."[1]

At present airplanes are no faster for distance less than 200 miles than the railway system, taking into consideration the delays incident to embarking and disembarking and also the time required to go from the airport to the city. This drawback would be eliminated if transportation terminals could be constructed in centers of population.

In comparison with steamships, which move at half the speed of trains, the advantages would be proportionately greater.

The well-organized air lines of today have a regularity of schedule which approximates that of railroads or steamers.

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[1] Aero Digest, January, 1936, P. 64

Heavy fogs and storms sometimes delay railroads and steamers to a greater extent than they delay aircraft. An airplane can fly through a sixty-mile wind with comparative ease, whereas a steamship would have to heave to and be in grave danger of foundering.

It is difficult to obtain accurate figures on the cost of transportation by air because in most countries commercial aviation is subsidized by the government, although in some countries the entire amount of the subsidy is given to mail contracts. When a subsidy is granted to passenger carrying lines, the passenger fare is lowered proportionally to the amount of the subsidy.

One writer has expressed the cost per weight (passenger or freight) in this way:

"It appears that it costs about as much to carry one pound of freight one mile in an airplane as to carry one ton a mile in a railroad train, or about 2000 to 1. The tractive effort necessary to pull an airplane through the air is more than ten times as great per pound of gross weight as by a freight train. The train will coast on a 2 per cent grade, whereas a plane requires about a 20 per cent grade. The unit fuel consumption is about ten times as great for the airplane and the cost ratio may be even greater because the locomotive burns a very low grade fuel and the airplane a very high grade gasoline. The crew of a train carrying hundreds of tons of freight is five to six men. The crew of a weight airplane averages over one and a half men for each ton carried."[1]

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1. Mitchell, -op. cit.-, p.p. 107-108

Operators soon learned that the number of travellers who were willing to pay high rates for air travel was small. Consequently, development was guided along lines which would enable them to establish fares at an attractive level. The objective was accomplished without sacrificing safety, comfort, and convenience of travel, and the air lines were able to establish rates comparable with rail plus Pullman. Travelling salesmen and other business men soon learned that a reduction in travel time brought about savings in incidental expenses.

"The average fare rate on December 21, 1926, was 12 cents a mile. The next year it had dropped to 10.6 cents a mile. In the next two years the rate climbed upward, and in 1929 the average rate was again 12 cents a mile. Air travelers, in other words, had to pay more than twice as much as they would have paid for railroad tickets.

"Nevertheless, air passenger traffic increased to 8,679 persons carried in 1927, and in 1928 the figure jumped to 49,713. The large increase in 1928 came in the year that saw the beginning of a reorganization of the industry, with some of the largest banks and most influential financiers in the country as its backers.--- Lines that had confined themselves to mail operations began also to carry passengers, lines were organized to carry only passengers or passengers and express, and all of the companies began to buy new equipment and train personnel for the business of passenger transportation.------

"In the winter of 1929-30 several of the large companies tried the experiment of reducing their fares to a level that had been regarded as impracticable a level on a par with first-

class railroad travel. Tickets were sold at a rate that permitted a traveler to go from coast to coast, flying by day and riding on a train at night, for approximately the amount he would pay for railroad fare and Pullman accommodations, and shorter flights could be made at proportionate costs. The planes were crowded immediately; passengers often were turned away because there was no spare for them. As a result of these reductions, the average air-passenger fare at the end of 1930 was 0.083 cents a mile.

"The efficiency of the low rate having been demonstrated by these tests, virtually all of the airlines adopted similar fares. From 1931 on, the level has been in the neighborhood of 6 to 6.5 cents a mile, and on December 31, 1933, the average passenger rate for American operated airlines was 6.1 cents per mile."[1]

Savings in time in air transportation through speed and directness and route are pronounced. Coast-to-coast air passenger service in less than 20 hours is available, and the Nation is covered by a veritable network of air lines operating on convenient schedules. One air line has used the slogan, "Every hour on the hour" and has operated aircraft on the advertised schedule. This air line has demonstrated to the industry that frequent service is an appreciated service, and other companies increased figuring of trips so that passengers can begin journeys at various times of the day.

The passenger phase of air transportation has become a very important part of scheduled operations during the past

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[1] U.S.Department of Commerce, April, 1, 1934, Civil Aeronautics in the U. S., p.p. 14, 15

two or three years, and this fact is due to the increasing interest on the part of the public in taking advantage of air travel. The business and professional men, the tourist, the newlyweds, and the shopper are among those who are constantly traveling by air. If passenger business on American air lines is any indication, the public has become air-minded in a substantial way for waiting lists for space on air liners is a frequent experience in ticket offices during summer seasons particularly.[1]

"Scheduled air transportation in the United States during September was marked by a seasonable decrease, but the 77,370 passengers carried was considerably in excess of 1934 figures when 45,248 passengers flew. The total number carried in August, 1935 was 89,581 the peak of American airline traffic for all time. Passengers carried during the first nine months of the year were 635,190 or more than the entire total last year.

"Passenger miles were 32,023,693 and miles flown were 5,360,092.

"Reflection of this tremendous traffic is seen in United Air Lines' reports for the first nine months of the year. Air increase of 24 per cent in passenger traffic was reported for the period as compared with the first three-quarters of 1934.

"Carrying 140,160 revenue passengers, United showed an increase of 26,866 passengers over the total of 113,294 passengers in the same period of 1934.

"American Airlines carried 153,056 revenue passengers during the first ten months of the year, a gain of 80.16 per

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1. The National Aeronautical Magazine, September, 1935, P. 25

cent over the same period a year ago. In this period the company consistently carried more passengers monthly than in any comparable month of its history, even extending this record an additional two months, making 14 consecutive months in all."[1]

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1. Aero Digest, December, 1935, P. 47

Air Express

Air express service over the scheduled air lines began in the United States about the time contract air mail service started, the mail planes carrying also express, in some cases, in addition to passengers and letters. In 1926 the volume of express moved was 3,555 pounds. The development of air express has not been so rapid as that of passenger and air mail service, but since 1931 the traffic figures have indicated the acceptance of the airplane as a medium of rapid transportation of merchandise.

Many types of merchandise may be sent profitably by airplane. Articles that are light and valuable, such as securities and jewelry, may be sent by air with the saving of a day or two in the time of transmission. Perishable articles such as cut flowers, fruits, vegetables, fish, and meats may be delivered quickly to discriminating consumers.

Whenever speedy delivery of merchandise is more important than the cost of transmission, air express is the logical carrier.

The Aircraft Year Book for 1935 states that 2,946,460 pounds of express were flown over the air lines of the United States in 1934. Further information on this subject may be quoted:

"Air express proved its popularity whenever goods could be transported by air line at a saving in time and money to the shipper or to the recipient. Introduction of high speed transports encouraged air shipments of perishable goods. The

air line operators believed that air express eventually should become their largest source of revenue. At the beginning of 1935 they estimated that it was one-half to two cents a mile, varying with different routes. The Railway Express Agency and the General Air Express handled the pick-up and delivery of shipments.

"During 1934 many lines of industry and business changed their policy of using air express service only in emergency. Time saved meant money saved so numbers of shippers became regular daily patrons of air express.

"Cut flowers and other horticultural products were steady air express cargoes.

"Pacific coast fashion stores were using air express to obtain last minute styles and accessories.

"Air express of all kinds of emergency tools and heavy machine repair parts saved manufacturers, construction companies and industrial concerns heavy losses which delays or shutdowns otherwise would have caused.

"The nation-wide system giving overnight service to all parts of the country was used continually by advertising agencies in the distribution of electrotype for advertising campaigns.

"In the banking field shipment of cancelled checks provided more traffic in 1934, and was saving hundreds of thousands of dollars in interest charges every year. One of the best customers of the airlines was the Federal Reserve System which expressed bundles of cancelled checks to New York banks on every plane from the south and west. Stock and bond houses

were shipping securities by air.

"Approximately 500 different things were identified in air express shipments, and the list was growing at the beginning of 1935.

"The amazing extent to which air express traffic developed in 1934 was reflected in a report showing that air tonnage handled by the Railway Express Agency increased more than 115 per cent over 1933, the number of shipments increased 102 per cent and revenues 90 per cent.

"At the beginning of 1935 the system of the Railway Express Agency included United Air Lines, National Parks Airways, Hanford Airlines, Rapid Air Lines, Bowen Air Lines, Central Airlines, General Air Lines, Wyoming Air Service, Braniff Airways, Chicago and Southern Airlines, Wedell-Williams Air Lines, Delta Air Lines, Boston-Maine Airways, Central Vermont Airways, and Gulf Airways. The Pan-American Airways System had a contract with the Railway Express Agency to handle its express shipments in the United States.

"The latest rate reduction was made August 15, 1934 and provided rates so low that Air Express could be used economically by all industries and private shippers. Minimum charges permitted shipment of packages weighing 12 ounces between any two airport cities on the Company's system for 85 cents, while 25 pounds could be sent between cities 149 air miles apart for one dollar. These charges included, of course, special pick-up and delivery, insurance up to $50 for shipments weighing 100 pounds, or less, and 50 cents a pound on heavier shipments with receipts for the shipper and from the consignee.

"General Air Express was organized in August 1928 as an association of airlines with a central office in New York and agreements for interchange shipments under a standard waybill.

"Rates over nearly all lines in the General Air Express group were based on four cents a mile a hundred pounds. For example a ten-pound shipment including pick-up in delivery, between New York and Chicago, 740 miles would cost $3.12; between Los Angeles and New York, $9.60; between New York and New Orleans, $5.28. The insurance rate was fifteen cents for 100 pounds assuming liability for negligence up to $50."[1]

One of the most important steps in the direction of making aerial transportation more serviceable to the ordinary citizen has been taken in the formation of a nation-wide air and air rail express service.

"Twenty-four airlines have joined in a unified air express system which, effective February 1, will provide service to shippers on a more expeditious and economical scale than had been possible under conditions which previously existed when two air express agencies handled the business.

"Through contracts signed by 20 of the 23 domestic airlines in the United States and Pan American Airways, with the Railway Express Agency, direct air express service, with door-to-door pick-up and delivery service, will be provided to 215 cities in the United States and Canada and to 32 foreign countries through the Pan American Airways System. In addition, through the use of combination air-rail service, the 23,000 Railway Express offices become air express stations.

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1. The Aircraft Year Book for 1935, p.p. 114-118

"The companies included in the coordinate set-up are: American Airlines, Boston-Maine Airways, Bowen Air Lines, Braniff Airways, Central Airlines, Central Vermont Airways, Chicago and Southern Air Lines, Columbia Airlines, Delta Air Lines, Eastern Air Lines, Hanford Airlines, National Airlines System, National Parks Airways, Northwest Airlines, Pennsylvania Airlines, United Air Lines, Varney Air Transport, Watertown Airways, Western Air Express Corp., and Wyoming Air Service. Only TWA, Wedell-Williams and Wilmington-Catalina Airline are missing and according to L. O. Head, president of Railway Express, efforts are being made to have these companies join the new combine.--------

"Development of air express traffic has been particularly rapid during the past three years, with poundage more than doubling annually until now it has become a regularly used transportation service by thousands of industrial concerns. Outstanding among these are the news and advertising fields, automotive industries, fashion goods and allied industries, motion picture companies, drug manufacturers and machinery makers."[1]

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[1] The Aero Digest, February, 1936, P. 68

CHAPTER XIII

UNITED STATES GOVERNMENT ACTIVITIES

The Bureau of Air Commerce of the United States Department of Commerce was established in 1926 as the Aeronautics Branch, and its name was changed July 1, 1934. Through this organization the Director of Air Commerce licenses pilots and aircraft, draws up air traffic rules for all flying crossing state boundaries, and administers these regulations along with other rules to promote the safety of the public, both in the air and on the ground. The department maintains the Federal Airways System.

The Government activities are as follows:

Bureau of Air Commerce, Bureau of Entomology and Plant Quarantine, Bureau of Fisheries, Bureau of Reclamation, Federal Communication Commission, Hydrographic office, National Advisory Committee for Aeronautics, National Bureau of Standards, National Recovery Administration, Public Health Service, Soil Erosion Service, Subsistence Homesteads, Tennessee Valley Authorities, United States Goedetic Survey, United States Geological Survey, United States Weather Bureau.

The United States Government is using aircraft extensively in carrying on the work of the various Bureaus and in other highly specialized work that can be carried on by no other means. The point of vantage is in the sky, and the Bureaus are aware of the advantages of a birdseye view from an airplane.

The Bureau of Entomology and Plant Quarantine fights

destructive insects by attacking them from the air.

The Bureau of Fisheries uses airplanes in supervising and patrolling the fisheries of Alaska.

The Bureau of Reclamation of the United States Department of the Interior makes contracts with various aerial service companies for photographic survey work on some of its projects.

The Federal Commerce Commission in 1934 drafted a set of regulations for aircraft radio operators.

The Hydrographic office during 1934 published sixty-two aviation charts, a majority of these covering areas outside of the United States.

The National Advisory Committee for Aeronautics has charge of fundamental scientific research and experiments in aeronautics.

The National Bureau of Standards of the Department of Commerce conducts investigation of materials, fabricated parts, apparatus and instruments for aeronautical use in cooperation with the Army, Navy, Bureau of Air Commerce, National Advisory Commission for Aeronautics, and other aeronautic organizations.

The National Recovery Administration took to the air in 1934. It is concerned with a vast number of complex problems incident to the promotion of business recovery in the United States.

The Public Health Service of the United States used aircraft extensively during 1934.

The Soil Erosion Service of the United States Department of the Interior are employing Fairchild Aerial Surveys to map about 24,000 square miles of lands in northeastern Arizona,

northwestern New Mexico, southeastern Utah, and southwestern Colorado embracing the Navajo Indian Reservation.

The Subsistence Homesteads' Division of the United States Department of the Interior employed Fairchild Aerial Surveys to make photographic maps of the areas in which projects were laid down during 1934.

The Tennessee Valley Authority of the Emergency Relief Administration used planes extensively during 1934.

The United States Geological Survey of the Department of the Interior in classifying the public lands for minerals and other resources are employing aerial mapping throughout the United States.

The United States Weather Bureau is charged with prompting meteorological service along the Federal Airways System.[1]

"The Federal Airways System, embracing over 20,000 miles of lighted and radio equipped air routes, furnishes guidance and assistance to airmen at all times. During daylight hours and in good weather, the aids to air navigation make it easier for the pilot to perform his task efficiently; at night they offer guidance which is even more welcome; and under conditions of poor visibility caused by fog, clouds, rain, or snow, the airway aids are indispensable. Time after time they have enabled aircraft to reach airports or intermediate landing fields safely in circumstances which might have had tragic results if this assistance had been lacking."[2]

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1. The Aircraft Year Book for 1935, p.p. 95-112
2. U. S. Department of Commerce, The Federal Airways System, July 1, 1935. For further information about the Federal Airways System see this bulletin (Aeronautics Bulletin No. 24).

High standards in air transportation have been established under federal supervision at small cost. The actual cost of airways construction is about $500 a mile. Operation and maintenance average $200 a mile for each year. These figures are low in comparison with the known cost of $9,000 a mile for a first-class highway.[1]

"Thus the air transport and Federal airways system, and the civil manufacturing and servicing facilities, constitute an indispensable element in our economic organization. They are of vital importance for their commercial services alone. But they take on additional importance in the light of the fact that while serving the needs of commerce and without extra burden they fit impressively into our national defense needs. And still more importance must be ascribed to civil aviation when its inevitable role in the next decade is realized. Already the modern tool for speeding up and otherwise aiding our economic life, it is certain to serve forthcoming business and industrial life even more effectively.

"Therefore, we believe the federal government fully justified in continuing its participation along the lines already established and proven productive of high returns in the fields of commerce and national defense."[2]

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1. Aeronautical Chamber of Commerce, The Federal Government and its National Aviation Program, P. 13
2. Aeronautical Chamber of Commerce, -op. cit.- P. 20

CHAPTER XIV

SUBSIDIES FOR COMMERCIAL AVIATION

The theory that a commercial aviation policy is inspired by purely military ends is not an uncommon one. In the air policies pursued by some of the great powers during the past ten years many arguments are found for such a theory. Among these arguments the influence of the military authorities in questions of air organization, the employment and even the size of subsidies, and the training of personnel are of primary importance. With these questions in mind, it is not surprising that some people are convinced that a commercial aviation policy is a policy of armaments. This idea of identifying the commercial air fleet with the military power of a state is fatal to the development of commercial aviation on lines useful to all countries.

In a previous chapter, it has been shown that technically commercial aircraft are different from military aircraft. In the event of war a country cannot supplement its military air fleet by the addition of its civil and commercial aircraft. Commercial aviation can, however, supply a reserve to military air power by the provision of pilots, mechanics, technical personnel, aircraft equipment, and aircraft manufacturers.

An expert in aviation has made the following statement:[1]

"The number of military aviators and aircraft in the armies of the great Powers, large as it is, is insignificant when we compare it with the number of aviators and aircraft employed in the great war and who would be needed in the event

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1. League of Nations,-op. cit.- p.p. 133-134

of another war. At the same time, the cost of maintaining a permanent air fleet, the material of which would at all times be abreast of technical progress, would far exceed the financial resources of states. There is only one possible solution, and that is to create and develop a national commercial air fleet, the personnel of which can be used in case of war, and large enough for its requirements to ensure in peace time a sufficiency of work for a national air armaments industry."

There have been many failures in the expenditure of subsidies. These failures were due not only to technical imperfections but also to the fact that the companies had not created a satisfactory organization with one another. Reorganization was essential and the development of the system has taken different forms.

An English author has stated that there are two general principles of subsidy:

"(1) Either by the payment of a small subsidy in return for which a considerable number of machines, pilots and personnel must be maintained

"(2) By paying a comparatively small subsidy, while at the same time insisting on the practice of the utmost economy of operation.

"The first method creates an immediate and tangible reserve for service aviation. However the operation of air transport services is still in its infancy and the ways and means of saving expenditure can be learned only in the hard school of experience. It follows automatically that it may be a long time before a paying basis of operation is reached

during which period a large subsidy will be required to maintain a moderate reserve of material and personnel.

"The second method which involves the payment of a small subsidy and at the same time insisting on the utmost economy of operation seems to be the practical one. The British system of subsidy is based on this latter method.

The following examples will indicate some of the directions in which assistance may be rendered:

"1. The state may purchase aircraft and either hire or loan them to the operating companies.

"2. Aerodrones and general ground organization may be provided free of all charge. This may include repair facilities for aircraft, engines, etc.

"3. Fuel may be supplied without cost to air operating company.

"4. Bulk mail may be handed over to a company for carriage at a fixed contract rate.

"5. A percentage bonus on all traffic receipts may be paid.

"6. Subsidy based on either the carrying capacity of the fleet, the horse power of the machines used, the mileage flown, or on a combination of these, may be paid.

"7. The payment of a fixed rate of interest on capital may be guaranteed.

"8. A bonus on efficiency and regularity may be given.

"This last does not exhaust the possibilities. Any one of the methods enumerated above may be combined with either

one or more of the others."[1]

During the world depression, Great Britain, France, Germany, and Italy increased their appropriations and subsidies to aid the development of civil and military aviation. Great Britain, Italy, France, Poland, and Czeckoslovakia concentrated on military production while all nations showed a marked decrease in the commercial production of aircraft and engines.[2]

Government "Compensation" in most of the leading countries of the world has been discussed in a previous chapter.[3] During the past two years Japan and the leading powers in Europe have appropriated vast sums of money for aeronautics, but a large percentage of the amount available has been expended for military air defence. The German Government spent about $100,000,000 on its air forces in 1935.[4] The gross total of the British air estimates for 1934 was £20,165,600, and the net total £17,561,000 being increases of £527,000 and £135,000 respectively on its previous years figures.[5] Figures on the amount allocated to commercial aviation by Germany are not available, but the figure in Britain "was well below £1,000,000 while during the same year the United States Government subsidized its air mail contracts to the extent of some £3,000,000."[6]

"It is stated that in the United States the assistance which the authorities extend to commercial aviation in a variety of indirect ways represents a sum which approaches £20,000,000 a year."[7]

A large part of this sum is used to promote Governmental

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1. Edward and Tymms, -op. cit.-, p.p. 13-15
2. Aircraft Year Book of 1932, P. 222
3. Principal Air Systems of the World, Chapter 6
4. The Aircraft Year Book for 1935, P. 43
5. The Air Annual of the British Empire, 1934-5, P. 41
6. The Air Annual of the British Empire, P. 64
7. White, C. G., Flying-An Epitome and a Forecast, P. 244

activities as outlined in a previous chapter. In addition to these activities there has been "an energetic expansion of air mails, thus achieving a double purpose, in the sense that not only have aeroplane constructions and air line operators benefited but also the public has gained the advantage of a great and widespread acceleration in the transmission of its business letters."[1]

For the year 1935 the appropriation for air mail was $17,700,000. This amount included $7,000,000 for foreign air mail and was $1,300,000 less than the appropriation for the previous year.

The appropriation for commerce was $6,009,700 which was divided as follows: Air navigations facilities $5,274,900 and aircraft in commerce $734,800. The increase in the appropriation over the previous year was $407,900.[2]

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[1] White, C. G., -op. cit.-, P. 244

[2] The Aircraft Year Book for 1935, P. 469

CHAPTER XV

INTERNATIONAL COMMERCIAL AVIATION

Since its earliest days commercial air navigation has been pre-eminently international in character. Agreements regulating air transport in the various countries have been in force for many years, and, at various intervals, new international ties are formed, and joint regulations are framed, which enable all progressive countries to reap the benefit of recent discoveries and to attain certain common aims.

Important principles governing international air traffic were laid down in the three collective conventions relating to international air navigation; namely, (1) the "Convention relating to the Regulation of Air Navigation, dated Paris, October 13, 1919, the Ibero-American Convention relating to Air Navigation, signed at Madrid on November 1, 1926, and the Pan-American Convention relating to Commercial Aviation, signed at Havana on February 20, 1928.

"The Convention of October 13, 1919, was first mooted at the Peace Conference, when the French Government suggested to the various Government delegations which had met together in Paris to draw up the Peace Treaties that they should jointly endeavour to frame a text for the purpose of ensuring a uniform legal regime for international air navigation.

"The proposal was accepted, and by two resolutions, dated March 12th and 13th, 1919, the Supreme Council decided to set up a 'Commission for Air Navigation' consisting of representatives of twelve Powers.

"The Commission for Air Navigation at once recognised that it would be expedient if the proposed regulations took the form of an International Convention on Air Navigation; it defined its future work by drawing up a list of principles and it set up three subcommittees (technical, legal and military), each of which was responsible for drawing up the part of the Convention with which it was specially concerned.

"The text was examined by the commission at a plenary meeting, was subsequently revised by the Committee of Jurists of the Peace Conference and finally adopted by the Supreme Council under the name of Convention relating to the Regulation of Air Navigation.

"The Convention, which was opened for the signature of the representatives of the Allied and Associated powers enumerated in its preamble on October 13, 1919, was signed between that date and May 22, 1922 by twenty-nine countries.------

"On December 1929 the total number of States parties to the Convention was twenty-seven."[1]

The survey of the principles of air navigation as enumerated at the Convention is too detailed to summarise. All of the leading powers are either parties to collective conventions and separate agreements or prefer entirely separate agreements with each other. Copies of such agreements may be secured from the administrative authority under which commercial aviation is placed.

By applying to the Superintendent of Documents, Washington, D. C. for the "Executive Agreement Series" it is possible to examine the arrangements between the United States of

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1. League of Nations, -op. cit.-, p.p. 166-167

America and foreign countries which are relative to air navigation.

Commercial aviation was playing an important part in the international affairs of the world as the year 1932 was ushered in. Nearly two score countries in the Western Hemisphere from Alaska to Argentina were as close to New York as California and the Pacific Northwest had been a few years earlier. India, Australia, and South-Africa were days nearer the Capitals of Europe. To the importer and exporter, this meant a general quickening of world business, an enlargement of markets, and a much needed stimulus to a laggard period in world trade.[1]

Transport on the ground and transport by water have been responsible for the binding together of the people of a country. The carrying of news, goods, education, the visions of statesmen, the efforts of idealists has been responsible for unity, and for peace within the boundaries of some of our largest nations.

As the two means of transport have created a national feeling, so this sentiment which now exists in the minds of the people could be extended to an international feeling with the development of the third dimension of transport. It is hoped that with the increased use of the air, trade will be extended, nations will become more dependent upon one another, the jealous and over-ambitious nation will be called an "outlaw" and the more stable countries will be able to present a unified front in the cause of humanity and of peace. Thus the air may be regarded as a medium for unification and peace by encouraging flying over international boundaries, whereas in

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1. Aircraft Year Book of 1932, P. 221

the past we have sailed around them or, of necessity, come hard against them.[1]

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[1] The Air Annual of the British Empire, 1934-5, p.p. 5-6

CONCLUSIONS

It is written-"Your young men shall see visions, and your old men shall dream dreams". The dream of the ages has come true. Man has broken his bondage from the earth and is sailing the skies with human wings. No one can give an accurate prediction of the air possibilities of the future. It is said that the aerial age is just beginning.

In the consideration of the "future of aviation" comes the problem of the proper sphere of the air navigator. Regulations governing aerial flight will be necessary. It is probable that as aircraft become more numerous, there will be marked highways in the air. Planes will be confined to designated routes at certain altitudes. As we have train despatchers today, so we will have air despatchers tomorrow, and courses will be followed as closely and as accurately as though airplanes travelled on rails. As the years go by, airplanes will go to increased heights and will operate with greater efficiency; costs will diminish; more money will be expended in aerial development; scientific and technical minds will be devoted to experimentation, and the "wonders of today" will be trivial compared with the "marvels of tomorrow". The circuit of the globe in eighty hours will supplant Jules Verne's record of eighty days. Already airplanes have touched five states in fifty minutes and have crossed the continent in less than half a day. In a comparatively short time the speed of planes has jumped from 40 to 400 miles an hour; the weight has increased from 700 pounds to 40 tons; the size from 20 to 200 feet in wing spread; the capacity from 1 to 160 passengers. The trend

of the future, however, seems to be toward medium sized planes of great speed rather than large craft of ambling speed.

Looking into the future it is clear that, from the viewpoint of technical development, aircraft will do all that man asks of it if he will devote sufficient time and money to its perfection. But the technical and scientific problems of air navigation are considered, by some writers, as trivial in comparison with the legal, economic, and political problems of national and international navigation by the third dimension. The world development of aviation has been hampered rather than helped by the attitude of countries which refuse to adopt the wider vision and insist upon regarding matters from their strictly selfish and material viewpoints. An illustration of the political problem is seen in the announcement from Washington today that the Post Office Department is encountering secret international opposition to its plans for the extension of transpacific air mail services in China.[1]

Such political jealousy interferes with the progressiveness of commercial aviation. The world cannot enjoy the full fruits of the aerial conquest if it is not willing to give its wholehearted cooperation to the business of providing and maintaining a world-wide network of high-speed aerial routes. The large air systems of each country must be able to penetrate into other countries and must be permitted to connect with their air systems. Some progress has been made in the accomplishment of this objective. With an international board of air control, it would be easy to predict a system of globe encircling air transport.

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[1] Boston Evening Transcript, February 16, 1936, Part 2

The development of commercial aviation in the leading countries of the world has been traced and comparisons have been made. It has been seen that the United States has stepped from the role of laggard to the glamorous one of leader. The tentacles of the American Air Line Companies have spread over the entire world linking this country with foreign countries in a way that has been impossible hitherto. No apology need be made for air progress during the last quarter of a century, and looking confidently into the future one may well exclaim with Kipling, "We are at the opening verse of the opening page of the chapter of endless possibilities."

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